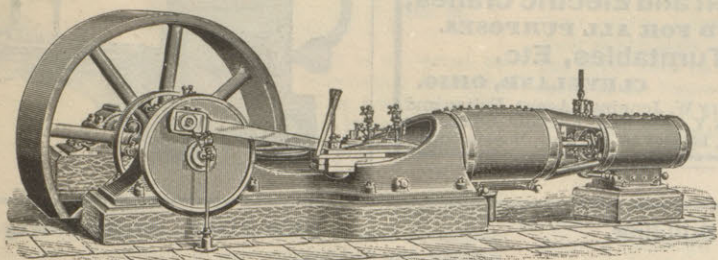


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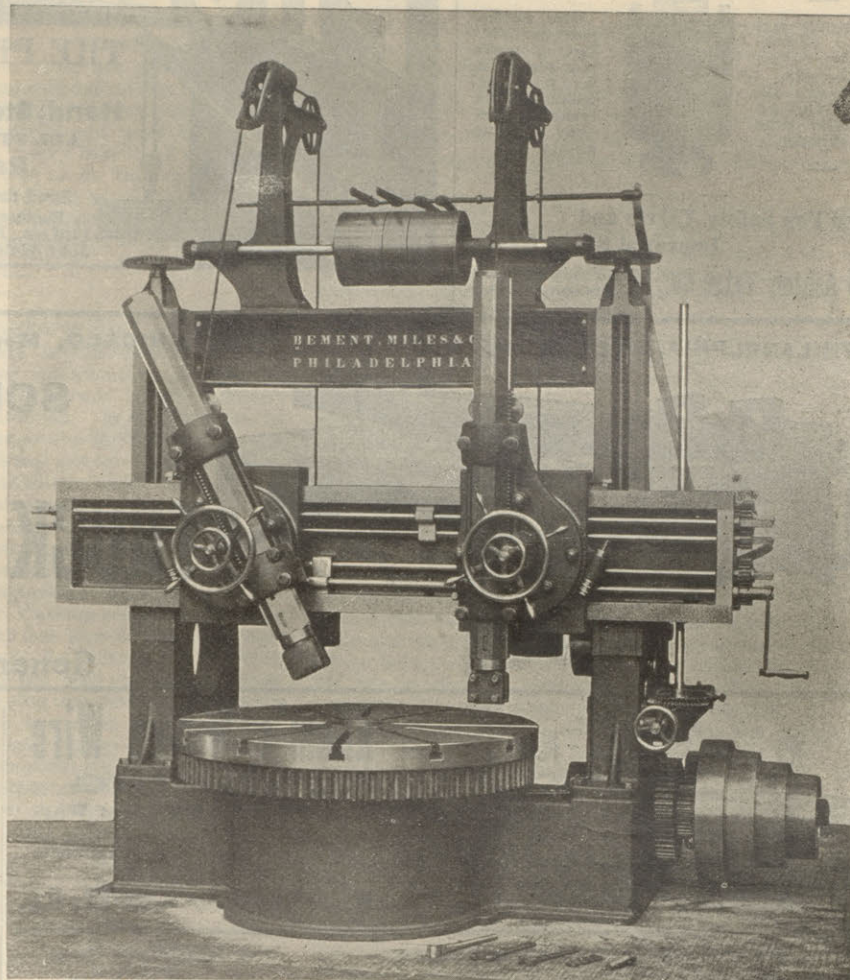
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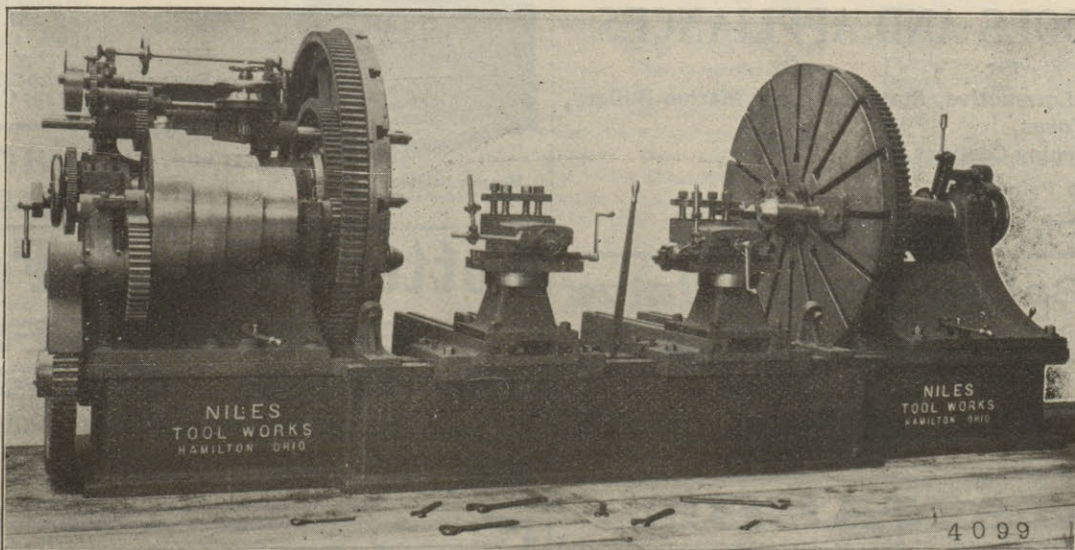
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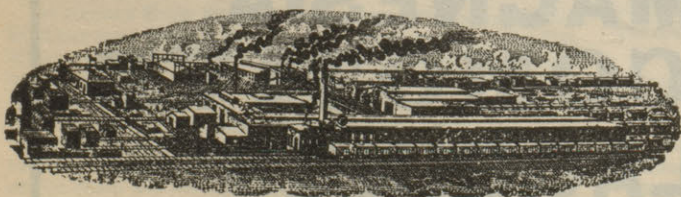
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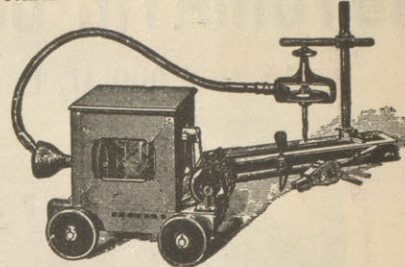
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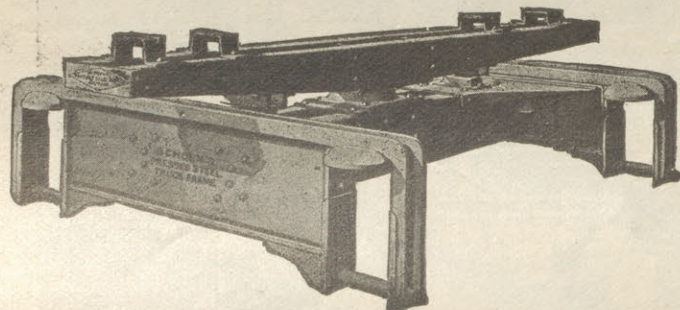
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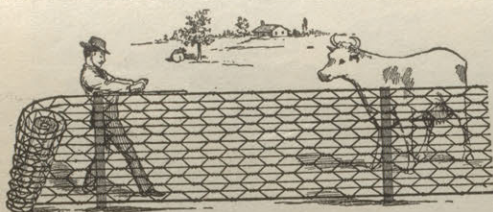


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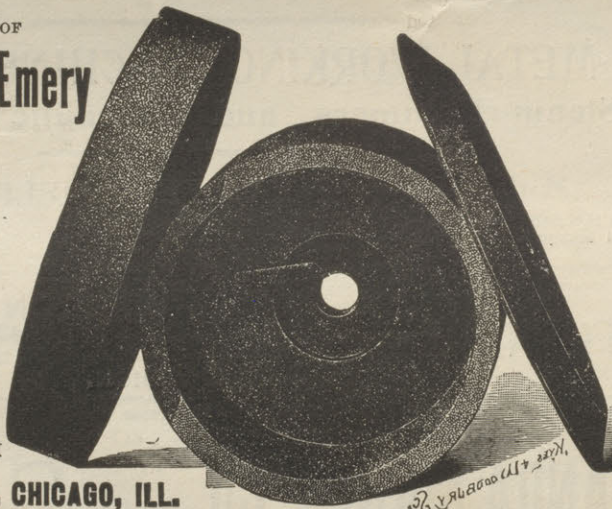
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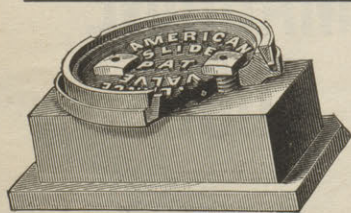
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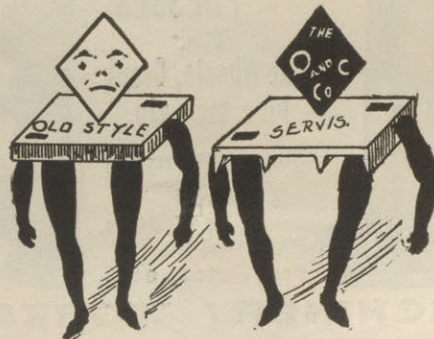
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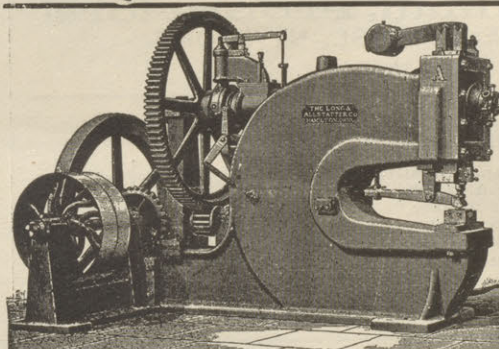
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I looks something like him
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Now I'm not him and he's not me
Nor are we the same;
So there you be.
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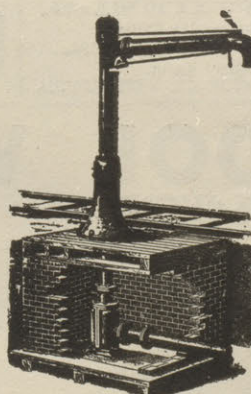
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THE RAILWAY REVIEW

XXXVI.

MAY 2, 1896.

No. 18.

A LONG BRIDGE.—A new bridge which is projected at Sydney, New South Wales, is chiefly interesting from its horizontal plan, to span a wide channel by which the city of Sydney is separated from some of its important growing suburbs. The proposed structure is to be a cantilever bridge of the Firth of Forth type, with 1,843 ft. between the centers of main towers. The lines of the existing streets in the two cities meet at considerable angles, and the engineer proposes to build the arms of each main cantilever on the street lines as now established and connect these by the suspended span of 300 ft. The estimated cost is somewhat more than five million dollars.

REVISING OLD THEORIES.—Lord Rayleigh ought to have some regard for our early education, and school-books, and the venerated schoolmasters, when he enters the lecture room, says Engineering Mechanic. The other day he demonstrated that all color was a shadow resulting from the removal of light, and therefore a substance which absorbed all the colors of the spectrum but one, was of the color it did not absorb. The professor said: "If we had an ideal blue glass, cutting away the red, yellow and green, and put with this a red glass, we should not mix the colors and get purple, but, since the colors acted by subtraction, should obtain nothing but blackness. A piece of white paper reflected light containing all colors in equal degree. If it were painted, the color was not generated in the act of reflection, but was produced by absorption; the layer of paint might be regarded as stopping certain colors out of the white light reflected by the white paper underneath."

RACIAL CHARACTERISTICS IN MACHINE DESIGNING.—Referring to the peculiarities of machine designing among different nations, Mr. Albert Williams, in the Engineering Magazine, notes that, according to accepted notions of racial characters, the English and Scotch are proverbially conservative, methodical, painstaking, and careful to secure durability by using sound material and often an unnecessary surplus of it, making safety a high factor. Their predilection for rigidity, leading to heavy frames and bed-plates, sometimes goes to cumbersome extremes. They have not got over a partiality for hand-work where special excellence is desired. Their machines are, as a rule, very reliable. The French are quick, sensitive, innately artistic in all their perceptions, particular as to details and finish, and somewhat given to an inordinate desire for originality of effect leading sometimes to bizarre designs; their products, however, "showy," are never absolutely unsightly. Attention is given to the appearance of tools and implements intended for the simplest and most homely purposes. Hand-work is preferred to machine work, partly because it is cheap enough to compete with the machine tool, and partly because of the abundant supply of intelligent, skilled artisans in the lower grade. The German designer, always well grounded in mathematics; calculates stresses and proportions minutely, but in the outcome does not shave so closely as the Yankee. He never allows himself to be hurried, and, in everything made for the home market, is conscientious. In the proportioning of parts with an eye for effect, he produces curved lines and rounded masses, reminding one of the drawing of the old Flemish and German artists. The American regards time and money as of the first importance. Labor is dearer than abroad, and while there is a large stock of inventive genius, there has been relatively a dearth of skilled operatives of the lower ranks—plenty of good foremen and men competent to manage complicated machinery, but few who (at the wages) could take the place of the machines. Hence we find a preponderance of labor saving devices, machinery supplanting hand-work in unexpected directions, for making and even assembling interchangeable parts, for handling materials and products.

LEVASSEUR'S FLEXIBLE TUBES.—"La Nature" illustrates the manufacture of Levasseur's flexible metallic tubes as carried on in the works of Mr. Ch. Rudolph, at Paris. The tubes are made of steel, bronze or brass, or of two of these, the inner pipe, for instance, consisting of brass, the outer of steel. When the material is first to be galvanized, the long narrow band passes successively through baths of acid and of tin, and is then dried and rubbed with asbestos. A train of rollers imparts the desired profile to the band which is coiled up, and then, on a mandrel, formed into a single or double tube consisting of very close spirals. Great strength is obtained by making the edges of the bands overlap, and folding and bending them into one another in such a fashion that rupture or breakage are hardly to be feared. Caoutchouc and asbestos strips, etc., can be introduced between the different strips. Ends are joined by introducing copper rings further secured in position by tubular sleeves provided with internal screw threads; they are also soldered. The tubes have already found a wide and varied application as gas, petroleum, steam and hydraulic pipes. They can bear very high pressures, severe blows, and rough treatment, and can be trampled upon with impunity. They are being used in the place of lead sheaths of cables, and would, if not too expensive, certainly be most suitable for many purposes.

DO PEOPLE EVER FORGET ANYTHING?—The brain of mankind has been defined as a kind of phonographic cylinder, which retains impressions made upon it through the medium of the senses, particularly through the eyes and ears. If this be true, memory must depend for its intensity or retentive qualities upon the degree of observation with which the record is made. Nor is this all. If memory's record is kept in the shape of indentations upon the folds of the brain matter, are they ever entirely effaced? In other words, do we really ever forget anything? May it not be that the inner depths of the brain memory have

stored up recollections of things which are never again purposely turned to, perhaps, but which instantly spring into being and flash through the mind whenever we hear or see something which recalls them? There are several well known mental phenomena which strengthen this theory. We know that memory often brightens during the last moments of life, and there are cases on record where Germans, French, Spaniards and others, who, falling ill in this country years after having entirely forgotten their native languages, recovered and used them upon their death beds. There is a theory that in all such cases the brain folds have relaxed, just as do the muscles and cords of the limbs and body, and that by so doing they expose the mind's monitor indentations (recollections), which were long since folded up and put away as material that could not be of any particular use.—Exchange.

THE HEAT CONDUCTING POWER OF IRON AND STEEL.—After a thorough investigation of this subject, W. Beglinger arrived at the following conclusions: The results show that the heat conducting power of the different kinds of iron is altogether different. It is, therefore, of the greatest importance to know the coefficient of the inner heat conducting power. Steel and wrought iron show a more uniform conduct in this matter than cast iron. It is not confirmed that hardening reduces the conducting power of steel by almost one-half, though it may be conceded that hardening will reduce it slightly. The difference in working, by forging or rolling, showed only in one case, with wrought iron, considerable differences for the conducting power, steel never. Casting seems to cause far more irregularities. Wrought iron showed generally better conducting power than steel. L. Holborn and W. Wien have compiled a table showing the heat conducting power of the different values. Concerning iron, the average value for the different kinds of iron and steel is given. The factor R indicates that through a plate of 1 centimeter thickness at a difference of temperature of 1 deg., for 1 square centimeter each, a quantity of heat passes, which will increase the temperature of R gramm of water by 1 deg.:

Copper,	R = 0.918
Iron,	R = 0.156
Steel,	R = 0.062 to 0.111
Zinc,	R = 0.292
Tin,	R = 0.150
Lead,	R = 0.079

GLUCINIUM AND ITS USES.—Prof. W. H. Morse, of Garwood's, is engaged in developing the manufacture and use of the rare metal glucinium. He has demonstrated that it is considerably lighter than aluminum, more durable and less extensible than iron and with an electric conductivity greater than that of copper. Glucinium is now worth about \$18 a pound. As this is only one-tenth the price of platinum, and as it is substitutive for it, the professor's experiments are directed toward obtaining a ready production, and placing it in quantity for electrical work.

ROLLING BOILER PLATE.—It is a practical impossibility to roll large sheets to the exactness that some boiler makers specify and their unreasonableness has borne fruit in what we think is an equally unfair but necessary stand on the part of the mills. It is one thing to handle a plate of steel cold and quite another to handle it hot, where every fraction of a second in its manipulation affects its character. It is a fact that on a given lot of, say, 100 plates that would average to a weight ordered, there would be a difference between the heaviest and lightest of fully 20 per cent. Such being the case, how can any man ask a mill to keep within a range of weights that is impossible no matter how represented by price.—[The Boiler Maker.

WANT OF HOMOGENEITY IN STEEL RAILS.—On the Kaiser Ferdinand North Railway, in Austria, two types of basic Martin steel rails have been used for several years, weighing 31.188 and 35.339 kilogrammes per metre, 20.96 and 23.75 lbs. per foot. Both became worn in the first few years. As the usual tests were not found quite reliable, hard and brittle rails, for instance, often withstanding very heavy blows, Mr. Ast, the technical director, caused some new tests to be made with 15 rails, all dating from the year 1893, but prepared in different ways. The material taken from the acid converters was brought in varying proportions into the basic converters of 12 or 20 tons; reduction and decarbonisation were effected by means of spiegeleisen, ferromanganese, and also aluminium. The lengths of 82 or 130 ft. left the rolls hot and were straightened cold. For the rupture tests bars were cut out of the upper surface, the interior, the web, and the base, the 60 test bars being all of the same dimensions. A detailed account of the experiments is given by Mr. A. R. von Dormus in the "Zeitschrift des Oesterreichischen Ingenieur und Architekten Vereins." The want of homogeneity is ascribed to the segregation of more fusible alloys. This segregation affects the interior particularly. From the outer layers the still liquid mass is squeezed out by the rollers. Owing to the quicker cooling of the outer layers an outer shell and an inner mass may be distinguished. The line of demarcation is generally sharp, as was clearly recognized by placing the bars and other pieces for several days in dilute hydrochloric acid. The shell was less attacked than the interior, but the border became studded with little holes like strings of beads. The experiments do not confirm the frequently expressed view that the stem is stronger than the base, and this again stronger than the head, because they are worked more. Chemical analyses were also made; they afford valuable help, but cannot alone decide much, since a great deal depends upon the accidental selection of the test piece.

ACETYLENE GAS APPLIED TO CARS.—One of the electric accumulator tramcars running between La Madeleine and Genevilliers, at Paris, has, since the last days of February, been lighted with acetylene gas, which here enters in competition with the incandescent lamps, as yet fed by the accumulators. The gasometer is placed under the stairway on the platform; it weighs about 26 pounds. The decomposition of calcium carbide by means of water takes

place under a waterhead of 13 centimetres (about 5 inches); a hydraulic joint connects with the gas pipe. The car is lighted by a butterfly burner, estimated at six carrels, giving sufficient light to enable people to read in all parts of the car. Mr. Broca, who has instigated this experiment, regards this illumination as very economical, although it is, of course, far too early to say anything about comparative cost. The slight bulk and weight are in favor of the acetylene. An ordinary gasometer would occupy more space, and accumulator cells be very much heavier. There is no more danger of explosion than with ordinary gas.

HYDRAULIC POWER SUPPLY.—The introduction of a system of hydraulic power supply into a large city like Glasgow, must be regarded as a boon by a large section of the community, for it is a city in which power of that kind can be extensively utilized. It is now over a year since this system was established, and we understand it has already been largely taken advantage of for such purposes as the working of hoists, cranes, presses, and like machinery. Special mains are laid through certain streets, and anyone wanting a supply can have it laid on with about as much simplicity as he can be supplied with gas. It is measured to each user by meter, and the meters are provided and maintained by the corporation. The nominal pressure is 1,000 lbs. per square inch, and that is sufficient for most operation, such as hoisting, bale pressing, etc., but where the machinery requires a higher pressure, such as boiler riveting, punching, forging, and other engineering operations, that can be obtained up to as much as three tons per square inch by the use of an "intensifier." The price is moderate enough to lead to its being largely used, for there can be no doubt it will save, in many cases, the need for an independent steam plant. The minimum charge is 24s. per quarter for 3,000 gallons and under; for larger quantities the scale shows a gradual reduction. To consumers who use as much as from three to four million gallons, the rate charged is 1s. 5d. per 1,000 gallons. This may be considered higher than it ought to be; but after some experience of the working of the system, it may be found possible to make a considerable reduction.

POSSIBILITIES OF TELEGRAPHY.—According to a report from Philadelphia, a new method of practical doubting the capacity of a telegraph line for the receipt and transmission of messages has been perfected. The principal depends upon the illuminating effects produced in a vacuum by alternations and comparatively low intensity but of high frequency. In the exhibition rooms in Philadelphia, an operator telegraphs over a long wire on the usual Morse instrument, and a second operator sends and receives at the same time over the same wire messages with the aid of the subtle light developed in the vacuum device, without interfering with the other system. In another room telegraphing between moving trains and stations without any metallic connections is practically illustrated. A third phase of the exhibition, that of communicating between vessels at sea and the land, would have been a great value to the pride of our ship building industry, the St. Paul, if it could be utilized for her benefit before the calamity which befell her last month. The method adopted is similar in these two cases to that of the duplex telegraph already described.

The American Society of Mechanical Engineers

Announcement has been made by the secretary of the American Society of Mechanical Engineers, that the professional papers which are to be presented at the meeting at St. Louis, May 19 to 22, will be as follows:

- Keep, Wm. J.—Strength of Cast Iron.
- Kent, Wm.—The Efficiency of a Steam Boiler. What is It?
- Eldridge, A. H.—Tests of Four Cylinder Triple Expansion Engine and Boiler.
- Hale, R. S.—Determining Moisture in Coal.
- Kettell, Charles W.—A Study of the Proper Method of Determining the Strength of Pump Cylinders.
- Goss, W. F. M.—The Effect upon Diagrams of Long Pipe Connections for Steam Engine Indicators.
- Carpenter, R. C.—A New Form of Steam Calorimeter.
- Hoffman, J. D.—A Hydraulic Dynamometer.
- Henderson, George R.—Spring Tables.
- Whitman, Jay M.—Effect of Retarders in Fire Tubes of Steam Boilers.
- Whitham, Jay M.—Experiments with Mechanical Stokers.
- Thurston, R. H.—Superheated Steam.
- Bryan, Wm. H.—Western River Steamers.
- Alberger, L. R.—A Self-Cooling Condenser.
- Porter, H. F. J.—Hollow Steel Forgings.
- Hutton, F. R.—A Classification and Catalogue System for an Engineering Library.
- Murray, Thos. E.—A Steel Plate Fly-wheel.

The professional sessions will be held in the Southern hotel, and the convention is to be on the parlor floor. The opening session will be held at 9 p. m., on Tuesday, May 19. An interesting convention is promised.

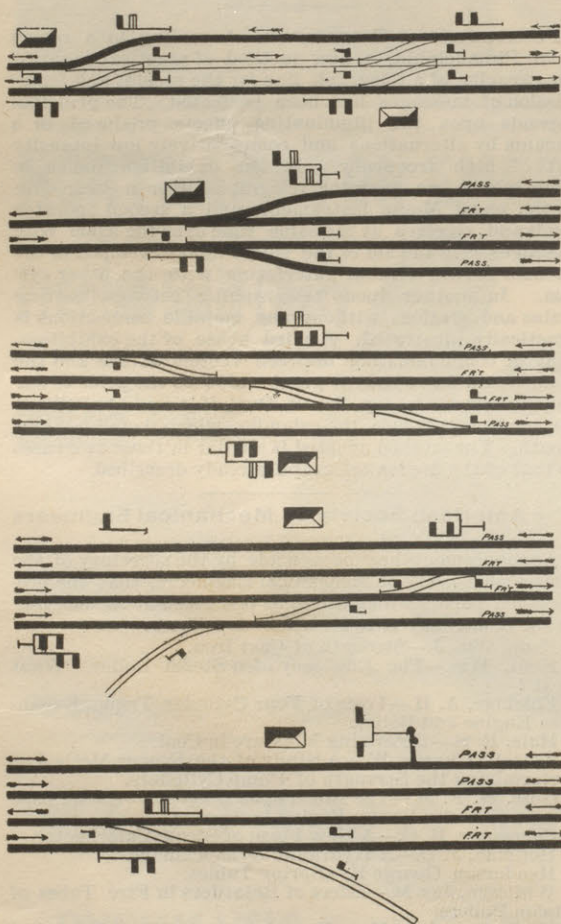
For this meeting, the Illinois Central Railroad has made a rate of a fare and one-third from Chicago to St. Louis and return, upon the certificate plan, under the rules of the Western States Passenger Association. Mr. H. F. J. Porter, western agent of the Bethlehem Iron Co., Marquette building, Chicago, is organizing a party to go from Chicago to St. Louis and return on the Diamond Special train of the Illinois Central Railroad, and if the party reaches the number of fifteen or more, he will be able to obtain a sleeping car for its special use.

The meeting convenes Tuesday evening, the 19th, but it is the opinion of those so far interviewed by Mr. Porter that it will meet the convenience of the majority of those going from Chicago to arrange for the special party to leave on the Diamond Special, Tuesday, May 19, at 9 p. m., arriving in St. Louis at 7:24 of the morning of the 20th, in ample time to participate in the general proceedings of the meeting. Those desirous, therefore, of availing themselves of this opportunity for pleasant, social intercourse en route, will be assigned space in this special car by applying to Mr. Porter, 1433 Marquette building, Chicago. An expression from those intending to go to this meeting is very much desired, whether they are desirous of joining this special party or not.

Sleeping car reservations in regular service will be made, and further information in regard to tickets, rates and limits will be furnished on application to Mr. H. J. Phelps, city passenger agent of the Illinois Central Railroad, 99 Adams street (Marquette building), Chicago.

SIGNAL DEPARTMENT STANDARDS—PENN SYLVANIA LINES WEST OF PITTSBURGH.

In January 1891, Mr. Joseph Wood, then general manager of the Pennsylvania Lines West of Pittsburgh with the assistance of Mr. W. McC Grafton, signal engineer, issued a pamphlet devoted to recording and explaining the systems of standards which had been adopted upon these lines for the guidance of men in the department and for the instruction of those who are guided by signaling apparatus. This code has been revised by Mr. Grafton under the direction of Mr. L. F. Loree, the present general manager, and through Mr. Grafton's courtesy we are enabled to illustrate and describe these standards. The object of this illustrated code is to preserve uniformity in signal and interlocking work and the principles of signaling, diagrams of application, specifications for construction and plans of towers are included. The organization of the signaling department is first described, at the head of which is the signal engineer, who reports to the general superintendent of each system for work done on that system. He has charge of the erection work and inspection, and sees that the standards are maintained. The supervisor of signals reports to the engineer of maintenance of way of the division in which he is located. He also keeps the signal engineer advised of the condition of the work under his charge. No changes in the apparatus or the locking are made without the instructions of the signal engineer. The lever and lamp men report to the supervisors. The general principles under which the interlocking is installed and operated are given in the following paragraphs which are illustrated where necessary



SIGNAL STANDARDS FOR PENNSYLVANIA LINES WEST OF PITTSBURGH.

and examples of the illustrations are shown in the accompanying engravings which are self explanatory.

GENERAL PRINCIPLES OF SIGNALING.

- The signals used must be of the semaphore pattern, and consist of a post with a movable arm pointing to the right; the arm having either a square or forked end. The shape and position of the arm indicate how trains shall proceed, as follows:
 - An arm with a square end is a "home signal". In a horizontal position it indicates "danger, stop". Inclined at an angle of 45 deg. to the horizontal, it indicates "caution, proceed carefully". Inclined at an angle of 75 deg. or more to the horizontal it indicates "safety, proceed". At night these positions may be shown by illuminating the arm or indicated by colored lights:
 - Red for horizontal.
 - Green for an angle of 45 deg.
 - White for an angle of 75 deg. or more.
 - An arm with a forked end is a "distant signal". It is used in connection with the "home signal" for a high speed route, and regulates the approach thereto. In a horizontal position its indication is to approach its "home signal" prepared to stop. Inclined at an angle of 75 deg. or more to the horizontal its indication is "safety, proceed". At night these positions may be shown by illuminating the arm or indicated by colored lights:
 - Green for horizontal.
 - White for an angle of 75 deg. or more.
- All semaphore arms must point to the right.
- A separate post must be used for each track to be governed.
- Each signal must be placed, whenever practicable, on the right hand side of the track it governs, except where a bridge is used, when it must be placed over the right

hand rail. Where practicable, the tracks should be spread so as to allow each signal to stand directly at the right of the track it governs.

5. High semaphore signals must be used to govern running tracks in their right direction. On single track both directions are right directions.

6. Low semaphore signals may be used to govern running tracks in their right direction at terminal points. They must be used to govern running tracks in their reverse direction, and all other tracks in either direction.

7. Excepting for train order and switch signals, two arms must be used on all high home signal posts, the top arm to govern the main or high speed route, the bottom arm to govern all diverging routes. Where there are no diverging routes, the bottom arm must be fixed in the horizontal position, and show a red light at night. No more than two arms shall be used on a home signal post, nor more than one arm on a distant signal post.

8. All signals, with the exception of interlocking signals which face the tower, must be provided with back lights.

9. Home signals must be placed at the first fouling point, or point of danger, which they govern.

10. Advance home signals will be used when necessary.

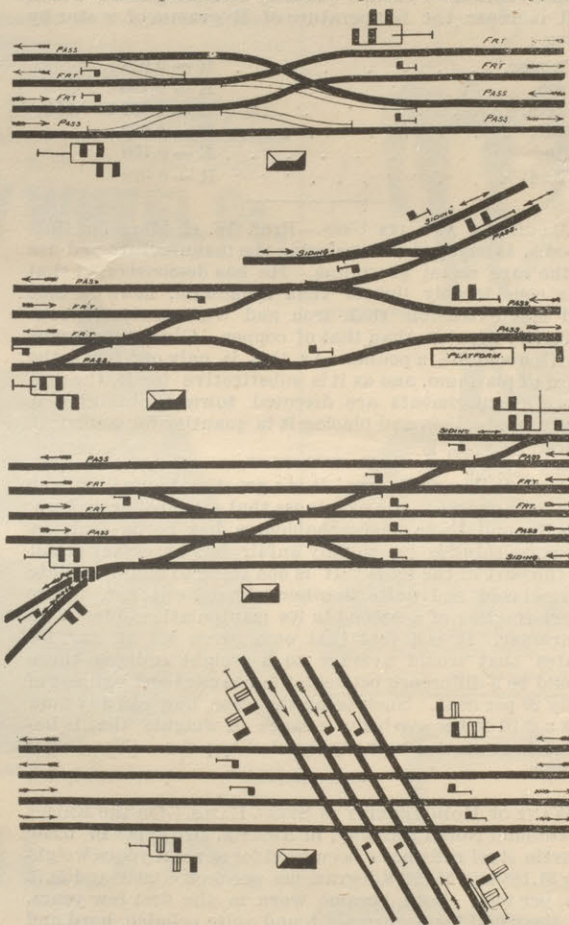
11. Block signals may be made a part of an interlocking system, and when so arranged, a clear distant interlocking signal will also indicate that the block signal is either at clear or caution.

12. Distant signals must be used only where the speed of trains is not limited by local conditions, and must indicate safety for high speed route only.

13. Distant signals for a tower in advance must never be located at a distance less than 600 ft. in advance of a home signal of the tower in the rear, and in no case shall any interlocking signal be located between a home signal and its distant signal.

14. A high semaphore signal may be used as a distant switch signal at points where the signal at the switch cannot be seen a sufficient distance. This signal in a horizontal position indicates that the switch is open.

15. All semaphore arms must be painted uniformly, and



of a color which will show most conspicuously against the surrounding background.

16. Illuminated arms may be used in new work and renewals.

17. The construction must be such that any failure of parts directly controlling a signal shall cause the arm to return to the horizontal position.

18. Lights in the tower must be so placed as not to be directly seen from approaching trains.

19. Interlocking machines must be of the latch-locking type, in which the first movement of the latch of any lever locks all conflicting levers.

The original specifications of construction have been considerably enlarged and improved by the addition of a number of new requirements among which the following may be noted: "One lever may be used to throw one or more switches, one or more locks, one or more detector bars, or one or more low speed signals, through a selector, but in no case shall one lever be used to throw a switch and a lock, a switch and a signal, a lock and a signal, a home and a distant signal or a high and low speed signal." The former rules called for rocker shaft lead outs for pipe connections wherever possible. The new rules have been changed in this respect and require bell crank lead outs wherever possible. Pipe lines may be used for all signals. A detector bar must be provided for each route and each crossing must be provided with them to insure clearance. When specified the turner facing point lock must be furnished for switches. This was illustrated and described in the RAILWAY REVIEW of June 1, 1895. The Grafton semaphore casting is required for all signals. Among the regulations not found on other roads and which certainly have

merit and strong recommendations, are those Mr. Grafton is introducing of putting two arms upon all interlocking signals in accordance with rule 7, proceeding. Where a fixed bottom arm is used as required by rule 7, it corresponds in size and outline to the standard semaphore and a standard lamp with a 5 in. plain red front light and a 2 in. plain blue back light is furnished for each. Where stubs are placed on bracket posts to indicate tracks not signaled a standard lamp with a 5 in. plain blue front light and a 2 in. plain blue back light is furnished for each stub.

Referring to the use of fixed bottom blades, it should be stated that Mr. Grafton has decided upon this system as a solution of the difficulty introduced by the non-uniformity of home signals. He puts two blades upon each and every home signal post whether a route signal or not, the top arm governing the main or high speed route, and the bottom arm governing all diverging routes. Where there are no diverging routes the bottom arm does not govern anything, but is fixed in a horizontal position and shows a red light at night. Mr. Grafton writes in regard to this signal as follows: "The reason we have for making this addition is that all home signals should present the same appearance by having two arms. It is then an easy matter for the enginemen to tell whether there is a light out or anything the matter with the signal. At present he has to think whether it is a point where there should be one light only or whether there should be two and one of them has gone out."

The specifications for construction are exceedingly explicit and cover every important item. They include rules for painting, and methods of constructing towers with dimension plans of the towers laid out on the system of lead out timbers the top of which lie 10 in. below the base of the rail. This is new since the first edition of the rules was published. The conclusion of the book gives a general explanation of signals for the use of trainmen. The work is thoroughly done and is characteristic of the road in the fearless adoption of improvements which are known to be correct and necessary. This is the only road in the country which has its standards presented in such definite easily understood form and signal engineers of other roads, who are getting out specifications and standards will be able to profit by the experience here delineated.

TRAIN RESISTANCE.

The record of the fast run on the Lake Shore & Michigan Southern Railroad, made last October, and the details of which were published in the RAILWAY REVIEW of October 26 and November 2, 1895, has not been accepted by a number of foreign railway men as authentic. Various British technical journals have published articles which convey the impression that the record was not credited on account of calculations which have been made, based upon old formulæ for train resistance, showing that it is impossible for the 10-wheeled Brooks locomotive to have made such speeds as were recorded. These calculations do not alter the facts, and as the theories to be correct must be based upon correct data, these theories are shown to be wrong by the actual recorded speed of the train. Mr. Angus Sinclair, writing in Engineering of London, defends the record and attacks the old formulæ, as follows:

Railroad men in America have enjoyed exceptional facilities for finding out with accuracy the extent of train resistance under all circumstances. Several railroad companies keep in use dynamometer cars, with highly perfected strain-measuring apparatus, and the men in charge of these cars are all well educated mechanical engineers. All of these men agree that there is not a locomotive in America, which could hold a train of four cars up to a speed of 70 miles an hour, if the Clark formula were correct, yet that speed is made daily on many of our trunk lines.

About 12 years ago I enjoyed the privilege of indicating a variety of locomotives on different kinds of trains on prairie railroads of Iowa and Illinois. When I began that work I was a firm believer of all Clark's formulæ, for "Railway Machinery" had been my mentor and guide from boyhood up. To my chagrin and dismay, I could not get the records of the indicator diagrams to approximately agree with Clark's formula of train resistance. A common experience was, to have the train raised to the running speed and maintained there for 10 or 20 miles without perceptible variation. I have repeatedly taken 10 indicator diagrams, when the train was running at uniform speed, which did not vary 1 lb. in mean effective pressure. Every engineer will agree that indicator diagrams taken under these circumstances provide a reliable means of calculating the work done by the engine, and, therefore, of the total resistance of the train. In no case could I get resistance per ton to agree with the Clark formula. I have indicated locomotives on many railroads all over the country since that time, and my experience has always been to the same effect.

This is the experience of all American engineers who have devoted attention to investigating train resistances. An engineer of tests who was for three or four years in charge of the dynamometer car of one of our trunk lines writes me: "My experience on the dynamometer car has served to convince me of the utter chaos in which the whole question of train resistance seems to stand. The ordinary formula $R = \frac{V^2}{171} + 8$ does not represent anything near the observed resistance, and the rate of increase

(the square of the velocity) is altogether too great. The investigations of Professor P. H. Dudley, whose dynamometer car is used constantly on the Vanderbilt lines; of Mr. D. L. Barnes of Chicago, who has done a great deal of expert engineering work for railroad companies; and of Mr. G. R. Henderson, mechanical engineer of the Norfolk & Western Railroad, who has made the subject a special study, all point to the conclusion that the formulae of train resistance given in all the engineering text books are wrong, except Kent's, which is based on observed data. If you analyze the indicator diagrams taken by Stroudley on the London, Brighton & South Coast Railway several years ago, and used in connection with a paper contributed to one of your engineering societies, you will find that they testify against the text book formulae for train resistance.

Three years ago the writer indicated the locomotive pulling of the Empire State express on the New York Central Railroad, and a number of indicator diagrams and full particulars of the run were published in Locomotive Engineering. Three diagrams taken when the speed was uniform at 70 miles an hour, showed the train resistance to be 18.6 lbs. per ton. The particulars of that run were taken up by the late Arthur M. Wellington, C.E., editor of the Engineering News, who had probably devoted more attention than any other man to investigating the subject of train resistance, and he published a very exhaustive article on the subject; the gist of the article reads: "The element of axle friction only in train resistance is fairly determined at about 4 lbs. per ton for passenger and loaded freight cars, and 6 lbs. per ton for empty freight cars at a speed of 10 to 30 miles per hour. The general law of friction is also well determined, that at very high journal speeds the lubricants are so well carried around between the metallic surfaces that friction is greatly reduced, and may almost become evanescent. Mr. John W. Cloud and others have directly observed this fact in railway service, that at high speeds the journal friction proper may be less than even 2 lbs. per ton."

"It is now an admitted fact that the axle friction at the instant of starting is many times greater than after the vehicle is once underway, and that the drop from this high resistance, while very rapid is by no means instantaneous, but requires a speed of from 5 to 10 miles per hour before the normal rate is attained. The starting resistance at times rises considerably above 20 lbs. per ton, i. e., a car on a 1 per cent down grade, which gives an accelerating force of 20 lbs. per ton, will not always start of itself without aid. A force of 16 lbs. per ton will very rarely start a car in motion. A fair average is about 20 lbs."

"All these various data we have plotted on a little diagram reproduced herewith, to which we have added a solid black line to show what the evidence at hand appears to indicate as to the true rate of train resistance in pounds per ton. The six observations on high speed trains are shown by small circles, with the name of each observer attached. Above and below these are shown by dotted lines: (1) The old Clark formula as one extreme; and (2) the Crosby formula for air resistance as the other. The

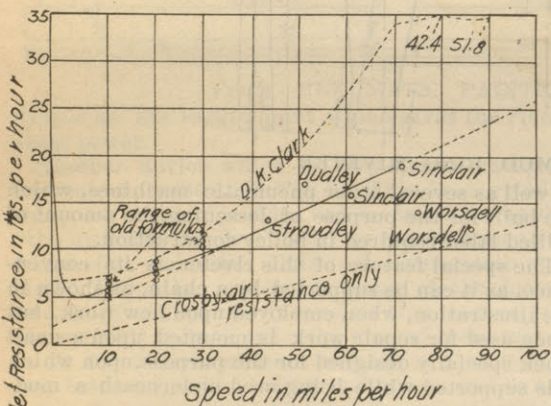


DIAGRAM OF TRAIN RESISTANCE.

range of the older formulae at 10, 20 and 30 miles per hour is shown at the left. There have been some showing still higher resistances than Clark's, but they have not met with general acceptance. For the most part the fall below Clark's at low speeds.

"Considering that the Worsdell observations are known to need small correction at least, Mr. Sinclair's two records come extraordinarily near to giving the mean of the four others. If we add to the Worsdell observations 6 lb. and 10 lb. per ton respectively, which would be the effects of a 0.3 per cent and a 0.5 per cent grade (15 ft. and 26 ft. per mile), they would fall exactly on the line which we have drawn as the 'weighted mean' of the six, allowing most weight to Sinclair's observations."

"Is it possible to find in this diagram any support for the theory that train resistance varies as the square of the velocity? We are unable to do so, especially as it is easy to see how the facts which we have narrated should make resistance observations within a narrow range of low speeds only appear to indicate that the velocity resistances vary as the square or even a higher power, when they really varied directly with the velocity. We by no means give our adhesion to the latter theory. We are merely weighing evidence. We do so that far as the existing evidence as to high speeds goes, all of it supports the latter theory, and none of it the older and heretofore accepted theory. It the solid line on the diagram gives a true mean of trustworthy experiments, then the resistance of passenger trains at speed is given by the equation

$$R = 0.24 V + 2,$$

or perhaps as accurately and more simply:

$$R = \frac{1}{4} V + 2.$$

"Both these forms are subject to a slight increment for difference in axle friction at speeds below 40 miles per hour, increasing as the speed falls, which is a more or less variable quantity, and for practical purposes may be neglected."

When the correctness of the text-book formulae for computing train resistance is impugned by so much evidence, it seems to me to be time that the engineering world of Europe was moving to find out the truth.

BABBITTED ECCENTRIC STRAPS.

The use of babbitt metal upon driving wheel hubs and other wearing surfaces of locomotives has been attended with beneficial results, the advantage of this method over using brass liners being the ease with which renewals may be made, and it was probably this fact that suggested to Mr. F. Mertsheimer, master mechanic of the Union Pacific Railway at Armstrong, Kas., the application of babbitt metal to eccentric straps. The ease of renewal of the babbitt has justified the application and an incidental advantage is gained in the ease of lubrication of eccentrics, the absence of heating and consequent freedom from slipping on the axles. The latter form of accident being unknown with this form of eccentric, renders its use very acceptable to engine runners who are freed from considerable anxiety on this account.

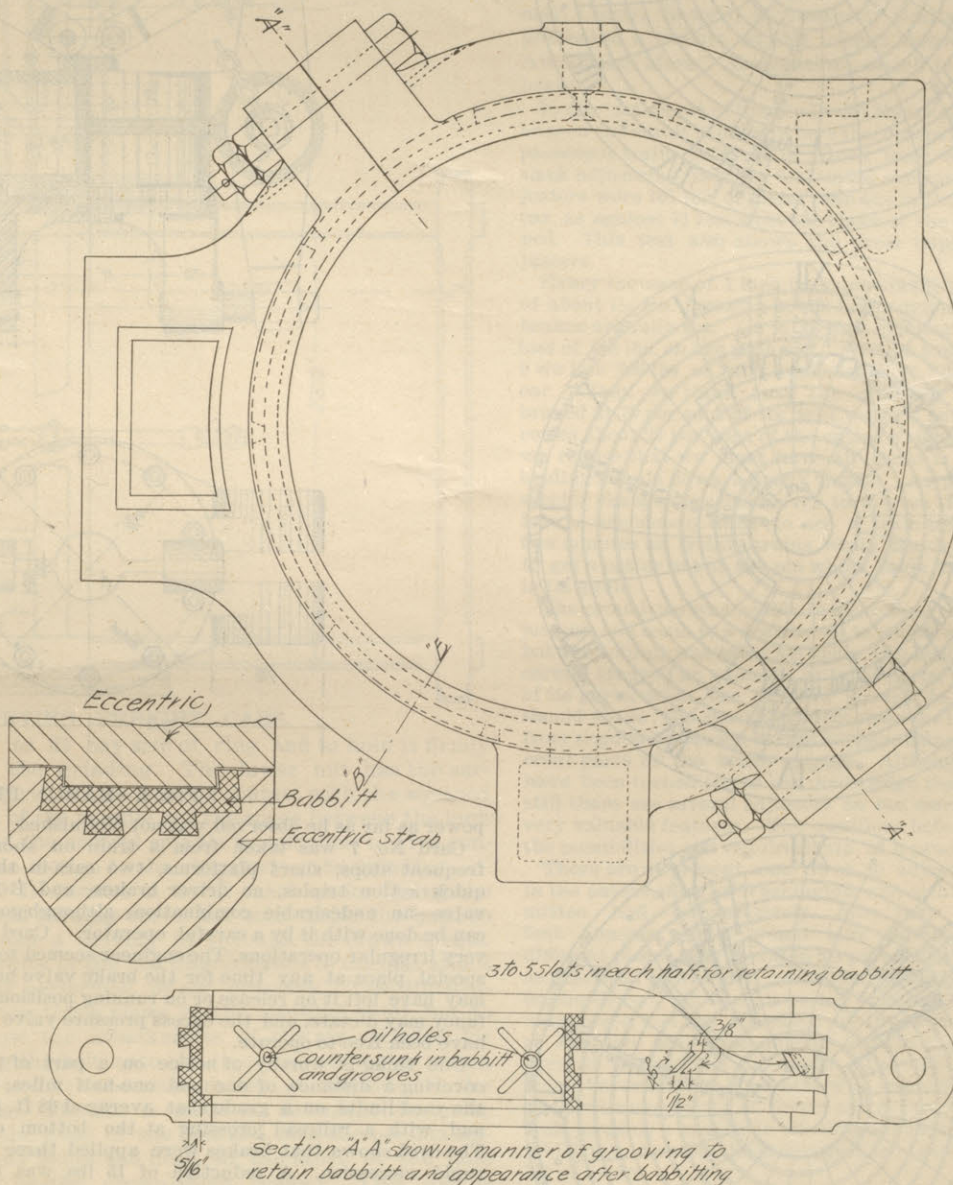
The accompanying illustrations were made from drawings for which we are indebted to Mr. Mertsheimer. They show the babbitt to be cast into the eccentric strap in a wide dove-tailed groove, with two smaller dove-tailed grooves at the bottom, the form of which is seen in the sectional view taken on the line B-B. The babbitt is cast into the strap upon a mandrel sufficiently large to allow for shrinkage and no further work is required in fitting them up except

ation has decided to levy a small tax upon the municipal property owners to make up the deficit. It is understood that in the course of the present year the company will require an additional \$15,000,000. Nevertheless, the traffic on the canal is reported to be steadily increasing, the docks at Manchester being described as crowded with vessels from different parts of the world.

AN AUTOMATIC AIR BRAKE RECORDER.

In a paper presented at the last meeting of the Northwest Railway Club, March 10, 1896, Mr. O. G. R. Parker, air brake inspector of the St. Paul & Duluth Railroad, described an application of the continuous disc pressure recorder to the air brake system of a passenger train for the purpose of obtaining a record of the manner of operation of the air brake by the engine runner. The following is taken from the paper:

The recorder has two movements; one is a rotary movement produced by clockwork situated behind the card and revolving it, making one revolution in twelve hours, thereby constantly presenting a new surface to pen or pencil. The second movement is obtained by using a Bourdon spring tube, such as is used in steam pressure gages. It is made in the form of a semi-circle, one end being rigid,



MERTZHEIMER'S BABBITTED ECCENTRIC STRAP.

to cut out the grooves which are countersunk into the babbitt for distributing the oil. The reports from these straps show that they have given excellent service. They have been in use nearly two years and have given greater mileage with the same amount of wear than cast iron bearing straps in the same service. Mr. Mertsheimer says that from actual measurements and records the babbitt line strap will prolong the life of the eccentric itself for from four to seven times that of the cast iron bearing. One of the first engines to which it was applied was running in heavy passenger service and made over 100,000 miles without re-babbitting the straps. With this arrangement no new eccentric straps ever need be applied to an engine on account of wear, also an old strap that would ordinarily be thrown away can be grooved and babbitted, making it as good as new. When the babbitt lined strap becomes worn, the old babbitt is melted out, about three or four pounds of new babbitt is added and the strap refilled, which makes the strap practically as good as new. The expense of renewing is therefore seen to be very light as compared with putting on new straps. The babbitted eccentric straps also run with fully 50 per cent less oil than the ordinary form and it was reported that such a thing as a hot or broken strap has not occurred on any of the engines using the new form. This arrangement has been patented by Mr. Mertsheimer.

It is announced that the Manchester Ship Canal Company will not be able to pay the interest on its \$90,000,000 of indebtedness this year. The corpor-

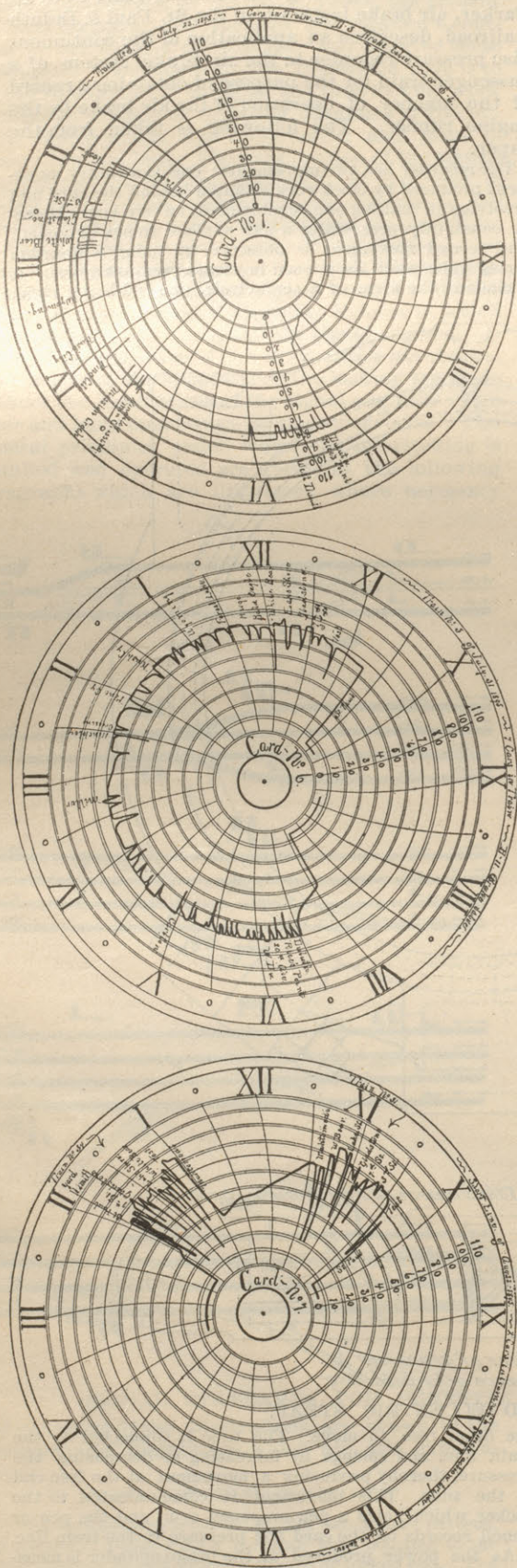
the other free to move. The tube is connected to the train line, and springs by increasing or decreasing the pressure, thereby producing a movement at the free end of the tube. This movement is communicated to the rocker which holds a pen or pencil arm, and the pen or pencil records on the card the pressure in the train line.

As the power produced at the brake cylinder is measured largely by the reductions made in the train line, piston travel being considered, we can ascertain by the aid of the card what power is being developed at the brake beams, and also how long that power was applied—two valuable items of knowledge, especially in mountain service. The cards also show the time of application by means of the clock movement, so that we can on the card, by the aid of time card or train sheet, select and name the station stops. It will also show if the brakes have been applied between regular station stops.

I have been in the habit of placing the recorder in the saloon of the rear coach in the train, making connection to the train pipe by placing a T in the pipe to the conductor's valve, and by means of a small hose connect the T to the nipple situated outside of the recorder box, and by closing and locking the box everything inside is out of sight and reach, so that it cannot be tampered with. You will observe that the card has a series of circular lines at equal distances apart, also a number of curved lines extending from center to circumference. The circular lines are the pressure lines from zero to 110 lbs., the distance between the lines being equal to 10 lbs. The curved lines are the time lines, and can be divided into as many parts as desired.

The recorded card will assist in locating when and where wheels were spotted by sliding; in fact it was a serious repetition of slid flat wheels in a Great Northern coach, while running over a foreign line that led to the adoption of the pressure recorder as being valuable when

applied to the operation of air brakes. The car referred to ran over a part of the Great Northern line, and at a certain point was transferred to a foreign line. On several occasions when the coach was returned at the point of transfer it was discovered, or had been reported, that wheels were spotted by sliding. Mr. J. O. Pattee superintendent of motive power of the Great Northern Railway resolved if possible to find the cause and locate where and by whom the wheels were spotted. Mr. Pattee did so by adopting and using a pressure recorder. By placing the recorder in a coach the recorded card showed the train line pressure to be from 65 to 70 lbs. while the coach was on the home line, handled by four different engines, and 115 lbs. when on the foreign line. Thus the recorded card decided conclusively who had to pay for the wheels.



Mr. Geo. D. Brooke, master mechanic of the St. Paul & Duluth Railroad, seeing the value of a pressure recorder, directed the construction of the recorder before you, and, although home made, it has proved to be a valuable instrument, and has more than fulfilled our expectations.

We have with us a number of recorded cards; some, in order to be observed readily, have been enlarged. We could, with profit, spend considerable time by going over each one, as each has its own characteristics, but, as this would consume too much time, we have selected a few lessons from them, and by comparing one with another we believe we will be able to demonstrate the value of the recorder, and substantiate any and all claims that we have made for it.

We will begin with No. 1, and follow the recorded line for a short distance, thereby enabling all to ascertain what the line indicates. The line begins at 1:10 p. m. at or near zero, and is maintained there until 1:50, showing clock movement while train pipe has no pressure. At this point the train pipe is charged as shown by the line, running from zero to the maximum pressure maintained in its train pipe. A reduction from the pressure in the train pipe, as shown by the line, indicates that the brakes are applied, while a return to a maximum pressure indicates that the brakes have been released.

The first application of brakes on card No. 1 is the test application, the lines showing a reduction of 13 lbs. The distance between the application and release lines show

how long the brakes remained applied. This distance is not exceeded by any application on the card. When making terminal tests it is not enough to know that the brakes apply and release, but it is also necessary to know that they hold after being applied. The length of time should be determined by what may be expected when running.

Card No. 1 was taken from train No. 3, of July 22, 1895, having four cars, all quick action triple valves, E-6 brake valve and driver brakes; leaving St. Paul at 2:15 p. m., arriving in Duluth at 6:45 p. m., a distance of 152 miles. The card shows, in 4½ hours, 19 applications of the brake and each application shows that the brake valve was handled intelligently by the engineer. The only serious objection on the card was too high train line pressure; but this objection was obviated to some extent by the fact that only two applications were made wherein equalization took place between auxiliary reservoir and brake cylinder, as equalization must take place before an excess of pressure in the brake cylinder can be obtained from too high train line pressure. This objection was remedied immediately, and the engineer admitted that the braking

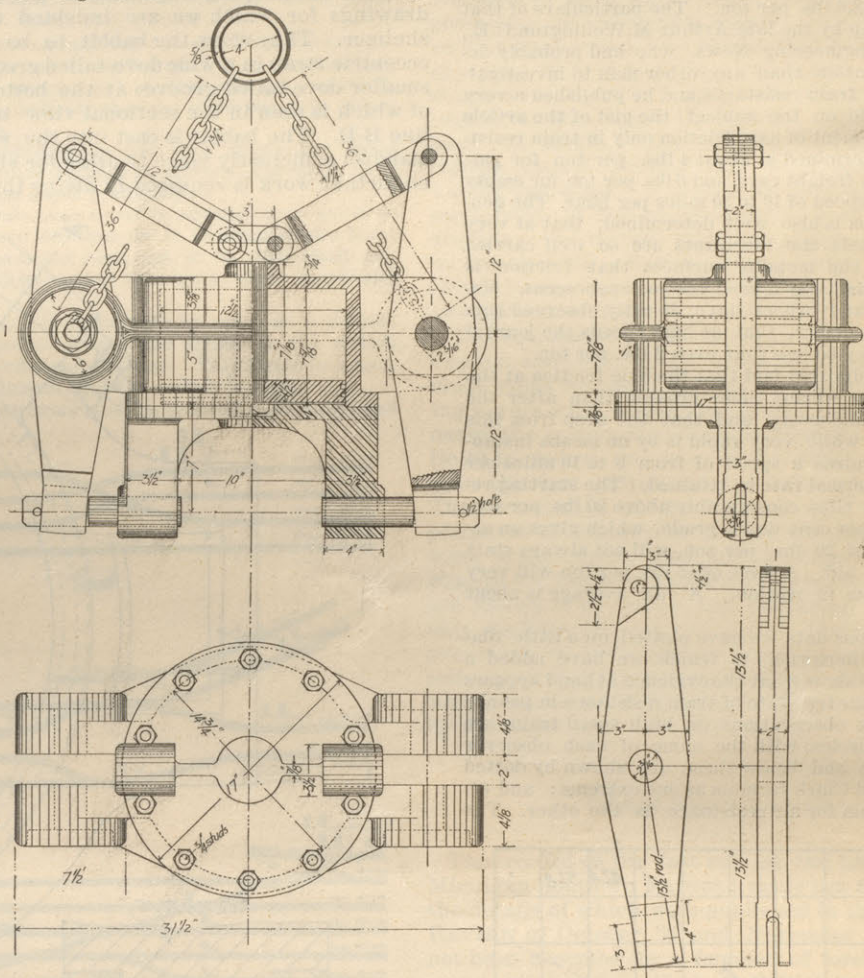


FIG. 1.—BAIRD PNEUMATIC MUD RING RIVETER.

power as far as he observed was not diminished.

Card No. 7 was taken from a train on short runs, frequent stops, short platforms, two cars in the train, quick action triples, no driver brakes, and B-11 brake valve—an undesirable combination, although good work can be done with it by a careful operator. Card 7 shows very irregular operations. The engineer seemed to have no special place at any time for the brake valve handle, he may have left it on release or on running positions, as his fancy may dictate, and the excess pressure valve may not have been free to operate.

One thing is worthy of notice on a part of this run, covering a distance of one and one-half miles, inside of the yard limits, on a grade that averaged 68 ft. per mile, and with a railroad crossing at the bottom of grade. The card shows that brakes were applied three times in rapid succession. A reduction of 15 lbs. was made for first application then the brakes were released. Another reduction of 29 lbs. was made for the second application, then released. For the last application a reduction of 49 lbs. was made. The crossing is reached, and with the aid of the reverse lever the train is stopped, no opportunity being given between applications for recharging auxiliary reservoirs. It seemed as if the engineer did his utmost to reduce the braking force from the auxiliary reservoirs by exhausting to the atmosphere through the brake cylinder.

In conclusion, one suggestion is made—we may have others later. When we began to use the recorder we found it necessary to make it clear to engineers that we were not after them, but after their lack of knowledge on air-brake matters, and that the recorder was merely a means to an end in instructing them generally on any errors that the cards may show. When this is understood, engineers usually take kindly to it, and even invite its use, so that instructing engineers from their recorded errors and failures becomes a pleasant instead of an unpleasant duty. Of course, if this fails to accomplish the desired results, severer measures will have to be adopted.

Central Railway Club.

The next meeting of this club will be held at the Hotel Iroquois, on Friday, May 8, 1896, at 2 p. m. The following reports will be received: "Car Roofs." Committee—E. A. Miller, chairman; S. A. Crone, E. A. Mitchell, A. C. Robson, Robert Potts and T. Sills. "Tool Rooms in Machine Shops and Best Methods of Handling Them." Committee—S. Higgins, F. B. Griffith and John Mackenzie.

The discussion will be on the report of committee on "Safe Ending of Boiler Flues;" report of committee on "Air Brake Testing and Inspecting Plants," and topical questions submitted by members.

SOME CONVENIENT PNEUMATIC APPLIANCES.

The Topeka shops of the Atchison, Topeka & Santa Fe Railway have acquired a reputation for the pneumatic apparatus which has there been developed and put into use for the purpose of cheapening the cost of locomotive and car repairs. In the RAILWAY REVIEW of last week a convenient appliance for assisting in the work of valve setting upon locomotives was described, and in the description of these shops a number of other devices were referred to, several of which are illustrated herewith. Among the devices is the Baird mud-ring riveter, which is easily the best machine of the lot. This is shown in Fig. 1, which was made from the working drawings. The design was prepared by Mr. Archie M. Baird, foreman of the boiler shops, who is also the designer of the Baird stay-bolt breaker and the stay-bolt cutter,

as well as several other pneumatic machines, which are built for the purpose of lessening the amount of skilled labor required in boiler construction.

The special feature of this riveter is its convenience, as it can be supported by a chain, as shown in the illustration, when employed upon new work, but when used for repair work is mounted upon a small truck specially designed for the purpose, upon which it is supported while being used underneath a mud-

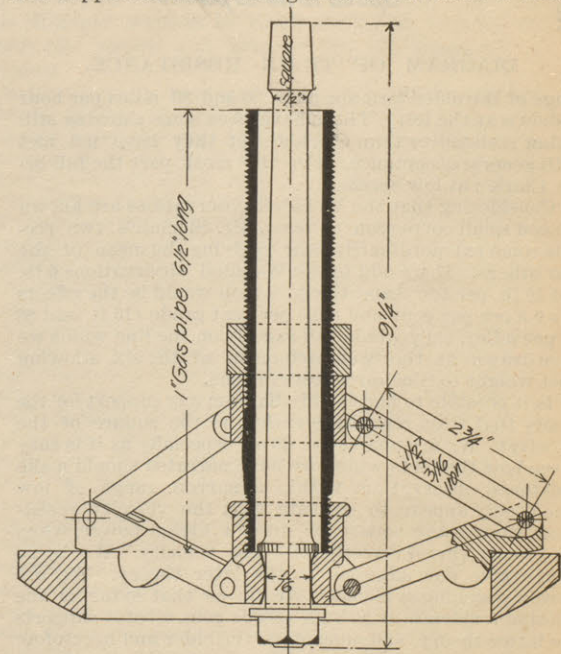


FIG. 2.—STEAM PIPE RING CHUCK.

ring of a boiler while the engine is being repaired. The operation of the machine will be readily understood from the drawing which shows a cylinder of cast steel carrying upon its sides two sets of trunnions for receiving the two main levers. Upon the lower cylinder head two projections are cast, in the lower ends of which bosses are cast, which are bored to serve as guides for the riveting plungers which fit through the slotted ends of the main levers, the plungers being flattened upon their ends to admit of passing into the slots. The connection between the piston and the upper ends of the main levers is

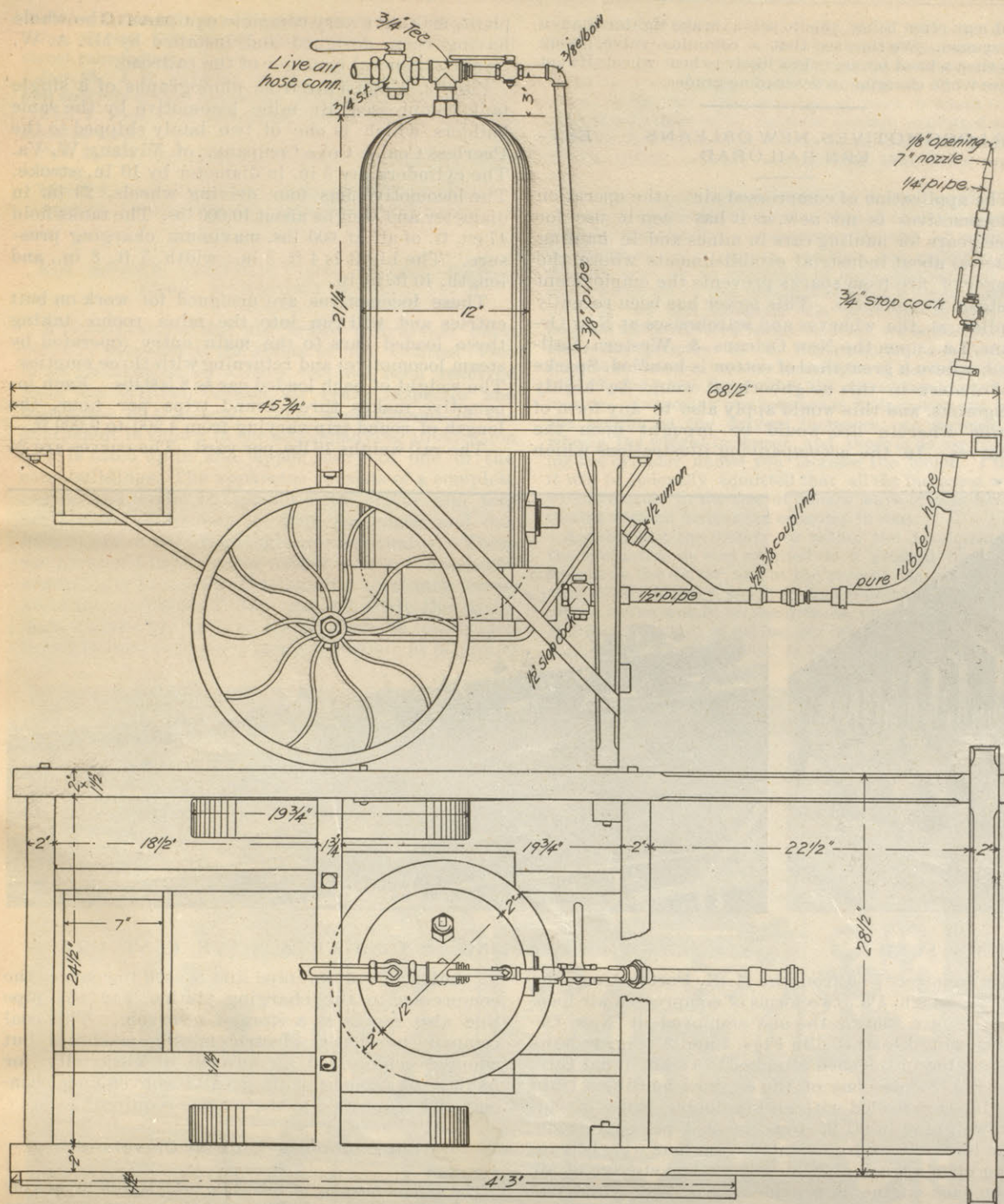


FIG. 4.—PNEUMATIC PAINTER FOR PAINTING FREIGHT CARS.

formed by the toggle joint which gives the riveter great power.

Another device which is very simple, cheap and convenient, is shown in Fig. 2. This is a grinding chuck for steam pipe rings and is called in the shop "the umbrella mandrel" from its resemblance to the frame of an umbrella. This device was gotten up by Mr. F. J. Gunther, general foreman of the locomotive shops at Topeka. It consists of a central spindle squared at both ends, the top end being tapered to fit the sockets of the rotary air motors used in stay-bolt work. The bottom end is squared so as to drive a brass casting, which has five sets of trunnions carrying as many brass arms, the form of which is adapted to hold a steam pipe ring from the inside in the manner indicated in the drawing. The brass casting is threaded to receive a piece of 1 in. gas pipe $6\frac{1}{2}$ in. long, which has a parallel thread cut upon its upper end to receive a nut, which bears upon the top of a short tube carrying trunnions similar to those in the bottom casting. By means of this thread upon the pipe, the mandrel may be ex-

panded to fit any size of ring and to hold it firmly during the grinding. The lower nut has the surfaces curved which come in contact with the squared portion of the spindle and the space between the inch pipe and the central spindle is sufficient to give considerable motion to the ring during the grinding.

Fig. 3 illustrates a novel machine for facing the heads and turning crown bar bolts under the head so as to make a driving fit through the crown sheets. The novelty of the machine consists in the operations all being performed by air pressure. The illustrations show three views of the machine itself, but do not show the attachments of the air cylinder for drawing the bolt up to the die or the air motor which is used to drive the small pulley at the side of the machine. The die is made so as to face the under side of the head of the bolt and turn the portion immediately below the head to the taper of the hole formed by the crown-sheet reamer. This die is placed in the die holder shown in elevation in the upper view, and the stay-bolt is passed into it from the front of the machine. The body of the bolt

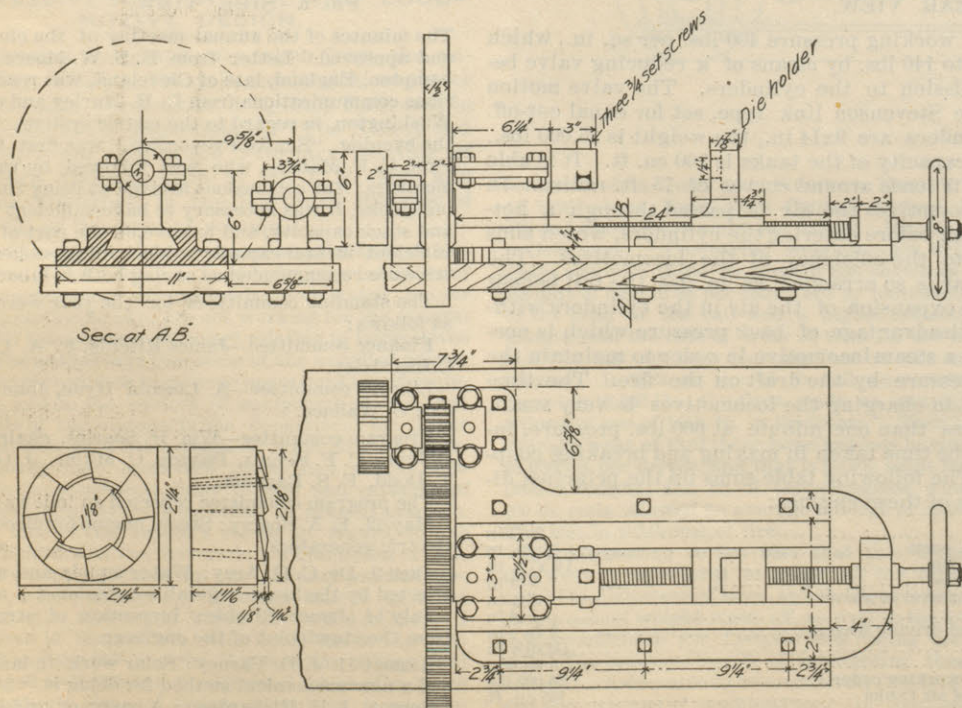


FIG. 1.—CROWN BAR BOLT FOR FACING MACHINE.

passes into the head shown at the left, where it receives its rotary motion from the spindle and large gear wheel. The movable head carrying the stay-bolt, receives its longitudinal motion from a lever which projects from the bottom of the machine, and is actuated by a small air cylinder underneath the table. This lever is brought against a stop, so as to stop the feeding of the machine when the head has been faced to a proper distance from the end of the bolt. The machine is tended by a man who has charge of the boiler shop tool room and who therefore has other duties to perform. The attendant places the stay-bolt in the machine and it requires no further attention until finished and a new one is put in.

The pneumatic painting machine, which was referred to in the issue of last week, is illustrated in Fig. 4, the drawing being sufficiently clear to require no further explanation than that given on page 219 in the description of the car shops at Topeka. It will be remembered that this device was arranged by Mr. James Collinson, master mechanic of the road at Fort Madison, Iowa.

AUTOMATIC BRAKE SLACK ADJUSTERS.

A committee consisting of Messrs. Blackall, Farmer, Corey, Sewell, Multhaner, Nellis and Lemke, presented a report at the recent convention of the Air Brake Mens' Association, which is given as follows:

In the last report of the Air Brake Mens' Association is to be seen the result of a test where there were three cars in a passenger train, only two of which were equipped with slack adjusters. In going 7,200 miles the cars with the adjusters wore 101 lbs. of metal from the brake shoes of each car, as against 71 lbs. from the shoes of the car not equipped. This test also shows the great importance of adjusters.

Every increase of 1 inch in piston travel means the loss of about $1\frac{1}{2}$ lbs. pressure in the brake cylinder when the brakes are fully set. On a 10 inch cylinder this means a loss of 118 lbs. on the push rod. With a total leverage of 9 we lose 226 lbs. on each brakebeam, or 1,064 lbs. on the car. When we think that the ordinary freight car is braked at 70 per cent of its light weight, and that this becomes about 25 per cent of the entire weight when loaded, we realise that we must have all there is back of us in holding a train down a heavy grade. At present the inspector changes the dead lever to give us this power, and it is no uncommon thing to see a train held from two to five minutes on freight trains while the inspector works to get a cotter out of the pin which holds the dead lever in its guide.

The committee was unable to make road tests of all adjusters, and come to a decision as to which was the better, but the subject was taken up under two heads. One, the careful study of an adjuster, as to its parts, the character of its parts, what the adjuster should do and what it should not do; the other the effect upon the braking power from angularity caused by the adjuster being placed in different parts of the brake rigging. Although as yet none have been turned out to our knowledge that are perfect, still there are several adjusters on the market containing very valuable features. The questions before us are as to the possibilities and requirements of a practical adjuster.

There are at present some 70 or 80 adjusters registered in the patent office at Washington, and although the committee had comparatively few, they had a sufficient number which would take up the slack in the different places that would in all probability be considered as practical. Of the ones used—the Standard took up slack on the tie rod, the McKee on the cylinder end of the cylinder lever, and the Hinckley on the bottom connection of the live and dead levers, and the dead lever test covered the method of other adjusters. Those used would cover all that is necessary in regard to loss or gain due to the angularity of levers and covered the ground as well as using a multitude of different adjusters, many of which would create the same effect as regards the angularity of levers.

There are certain requirements which must be met before we have the era of the successful adjuster, among them being the following, which are not based alone upon theory, but have also come to light through actual service. It must keep the piston travel within a certain fixed limit, and it would seem best to have the variation very small. It must take up slack to the desired amount, and also, if it can be done, let it out if occasion demands. There is bound to be more or less trouble if this requirement is not met, for as the age of a car increases it will of necessity gain a certain amount of free slack, such as is found in king bolts, boxes, spring in brake beams, etc., and this slack manifests itself more particularly when the brake sets, and all of these things tend to lengthen the piston travel abnormally, especially when the car is in motion. A car may run loaded for some time, and in the meantime have its piston travel adjusted, even if equipped with an adjuster taking up a very small amount of slack at one time. When the car becomes light the piston travel is shortened according to the height the body of the car is lifted above what it is when loaded, and according to the distance below the center of the wheel that the shoe is hung. If the adjuster is to be used on passenger cars, the idea of loaded and light cars does not become so prominent, as passenger cars are mostly loaded. We have seen a cut of but one device, the Universal Slack Adjuster, which claims to both take up and let out slack.

The location of an adjuster would best be as far away from dust and flying obstacles as possible, away from any drippings from steam heat, and be out of the way in case it is necessary to remove wheels. It should also be placed so as not to produce too great angularity of levers.

It must be built up of parts that will stand the strain when the braking power is high. Practical tests should be made by companies before deciding on any adjuster. It must be composed of parts not likely to weaken or get out of order.

It must be remembered that shoes wear out and must be

renewed by a car inspector, and the adjuster must be one easily understood, and that occasions as little work as possible in renewing shoes. An adjuster that takes care of itself after the first application of the brake takes away the chance of a mistake by a class of men who are not paid so much for what they know as for what they do, and while there are many exceptions, the average car inspector cannot cope with any complication. It should be of such parts as need no renewal except in case it is broken by collision, and should be one that permits of being easily applied or removed.

For freight use the adjuster must not depend upon the release of the brakes to work it, as in the freight equipment the cylinder spring forces only the piston to release position, and the return of the other parts to the desired position depends upon the jar of the wheels against the shoes and upon the angle of the brake beam hangers. These hangers should be at such an angle as to allow the shoes to leave the wheels under the action of gravitation, but we must remember that the friction of pins and rods must also be overcome to allow shoes to leave the wheels. Therefore, it is best, in freight service at least, not to depend upon the return of the brake beams and

light man often being able to set a brake tighter than a heavy man. We thus see that a retaining valve, giving less than a hand brake, is less likely to heat wheels if kept in use while charging in descending grades.

AIR LOCOMOTIVES, NEW ORLEANS ESTERN RAILROAD.

The application of compressed air the operation of locomotives is not new, as it has been in use for some years for hauling cars in mines and in hauling material about industrial establishments where the danger of fire from sparks prevents the employment of steam locomotives. This power has been recently applied at the wharves and warehouses at New Orleans, La., upon the New Orleans & Western Railroad, where a great deal of cotton is handled. Sparks and cinders in this neighborhood would be highly dangerous, and this would apply also to any form of power wherein fire would be brought upon the wharves. In the accompanying illustrations which

plant, making a very complete equipment, the whole having been designed and installed by Mr. A. W. Swanitz, general manager of the railroad.

Figs. 3, 4 and 5 are from photographs of a single tank compressed air mine locomotive by the same builders which is one of two lately shipped to the Peerless Coal & Coke Company, of Vivian, W. Va. The cylinders are 5 in. in diameter by 10 in. stroke. The locomotive has four driving wheels, 23 in. in diameter, and weighs about 10,000 lbs. The tanks hold 47 cu. ft. of air at 600 lbs. maximum charging pressure. The height is 4 ft. 5 in.; width, 5 ft. 8 in., and length, 10 ft. 5½ in.

These locomotives are designed for work on butt entries and will run into the mine rooms taking three loaded cars to the main entry (operated by steam locomotive) and returning with three empties. The weight of each loaded car is 8,500 lbs. Each locomotive makes three round trips per hour, the length of round trip varying from 4,500 to 9,000 ft. The rail weighs 16 lbs. per yard. The curves are 24

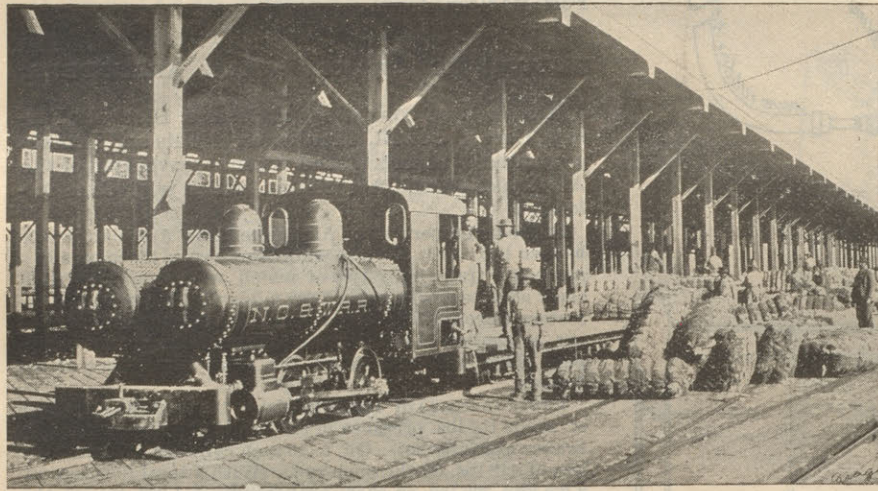


FIG. 1.—LOCOMOTIVE IN COTTON SHED

ft. radius. A 3 in. pipe line is used to connect the compressor to the charging station, and the pipe line also serves as a storage reservoir. This coal company purchased electric mining machines but adopted compressed air instead of electricity for haulage on account of its greater convenience, economy and adaptation to the service required.

It is essential as a matter of expense to railroads to do the work on a car with one adjuster rather than one on each truck of the car, as there is half the danger of disarrangement of parts and expense of maintenance with one than with two. The adjuster should be such that no braking power should be lost on account of energy lost in working an adjuster.

In setting most adjusters it should always be borne in mind that the travel of the piston is always greater when the car is in motion, and a corresponding allowance must be made.

An objection to an adjuster taking up a very small amount of slack at one time, as 1-32 of an inch, is that when a car is adjusted light it will take some time to re-adjust it when loaded or in renewing shoes; when slack is run out the adjuster will have considerable work to do. On the other hand, if the adjuster takes it up in a bunch, free slack will be taken up quickly, and the piston travel becomes too short.

have been received from the H. K. Porter Company of Pittsburgh, Pa., two forms of compressed air locomotives are shown, the one employed at New Orleans being illustrated in Figs. 1 and 2. Fig. 1 shows the engine in the shed attached to a train of flat cars, and Fig. 2 shows one of the engines hauling a train of nine cars loaded with eighty double bales of cotton weighing in all 92 tons, up a 3 per cent grade. The locomotives are mounted upon four wheels, running upon a track of 36 in. gage. The storage of air upon each engine is provided for by two cylindrical tanks, one of which is 15 ft. 2 in. long and the other 17 ft. 2 in. long. Both are 31½ in. inside diameter, and are made of ¾ in. plates with longitudinal seams sextuple riveted with two welt strips, and the circumferential seams double riveted. The thickness of the heads is 1½ in., and each front head is provided with a manhole.

The maximum charging pressure is 600 lbs. and the

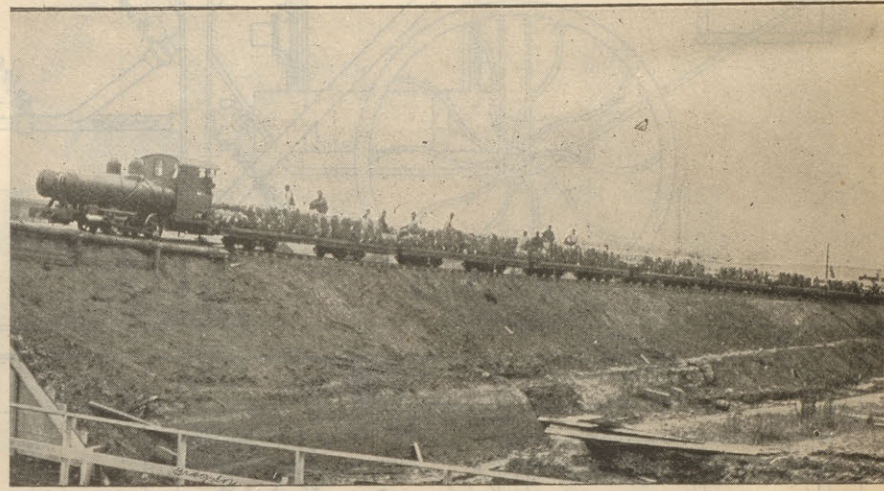


FIG. 2.—HAULING 92 TONS UP A 3 PER CENT GRADE

Civil Engineers' Club of Cleveland.

The annual meeting of this club, held March 10, was devoted to the election of officers and the reports of officers and committees. Present, 49 members and visitors. The following are the officers for the year: President, Chas. S. Howe; vice president, James Ritchie; secretary, Forrest A. Coburn; treasurer, Jas. C. Wallace; Librarian, A. Lincoln Hyde; 1st director, John L. Culley; 2d director, Jos. C. Beardsley.

The regular meeting was held April 14, 1896, President Howe in the chair. Present, 57 members and visitors.

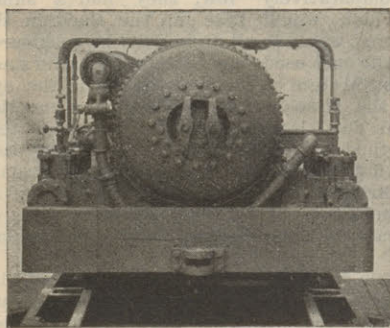


FIG. 3.—FRONT VIEW MINE ENGINE.

The tests made to determine the loss of braking power due to angularity of levers lasted over a week and consisted of about 250 tests. The readings were taken from a dynamometer placed upon one of the brake beams, and the results showed a slight advantage in taking the slack up on the bottom connection of the live and dead levers, but the committee considered this advantage off-set by the fact that adjusters placed in that part of the rigging were more likely to injury from ice and snow and flying obstacles, and the fact that they were in the way in removing wheels.

The following tests were made with each of the adjusters and with no adjuster; 10 to 1 leverage both in service and emergency with old shoes, new shoes, old and new shoes mixed.

The same tests were made with a 5 to 1 leverage. In each test several readings were taken, both of pressure and lever angles, and the averages compared, the result before mentioned being obtained.

After the tests to find the effect of lever angularity upon braking power were completed, another test was made, which, although not bearing directly on the subject of slack adjusters, still it was deemed best to put in the report as interesting and instructive. The test consisted in getting a comparison between the power given by a retaining valve holding a 15 lb. pressure and that given by a man of ordinary strength. Mr. Lemke and a man of 160 lbs. weight each set the hand brake, and the average was taken as the braking power with a man of average strength at the wheel. It was found that a hand brake set by a man was equal to 27.5 lbs. in the brake cylinder, or a retaining valve holding 15 lbs. was equivalent to just a fair hand brake.

This, of course, is simply a comparison, as there is a wide range of power developed by different men, a very

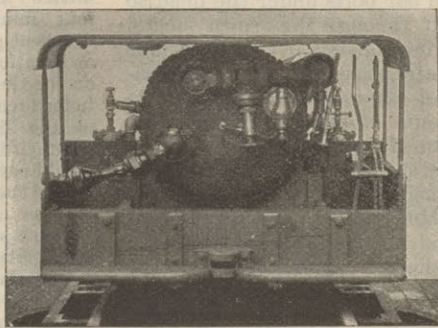


FIG. 4.—REAR VIEW.

ordinary working pressure 400 lbs. per sq. in., which reduced to 140 lbs. by means of a reducing valve before admission to the cylinders. The valve motion is of the Stevenson link type, set for equal cut-off. The cylinders are 9x14 in., the weight is 25,000 lbs., and the capacity of the tanks is 160 cu. ft. It is able to haul its loads around curves of 75 ft. radius. In these locomotives the air is passed through a hot-water tank before entering the cylinders, which adds greatly to the efficiency of the locomotives. The valve gear is so arranged as to get the full benefit from the expansion of the air in the cylinders without the disadvantage of back pressure which is necessary in a steam locomotive in order to maintain the steam pressure by the draft on the fire. The time occupied in charging the locomotives is very small, being less than one minute at 600 lbs. pressure, including the time taken in making and breaking couplings. The following table sums up the principal dimensions of these engines:

Cylinders	9x14 in.
Admission ports	¾x7½ in.
Exhaust ports	1¼x7½ in.
Lap of valves	5-16 in.
Maximum travel of valves	2½ in.
Lead	1-16 in.
Diameter of driving wheels	2 ft. 2 in.
Journals	4¼x5½ in.
Wheel base	5 ft. 8 in.
Weight in working order	25,000 lbs.
Capacity of air tanks	165 cu. ft.

This railroad serves a large plant occupying about 250 acres, and containing 80 cotton warehouses with hydraulic presses, air compressor and electric light

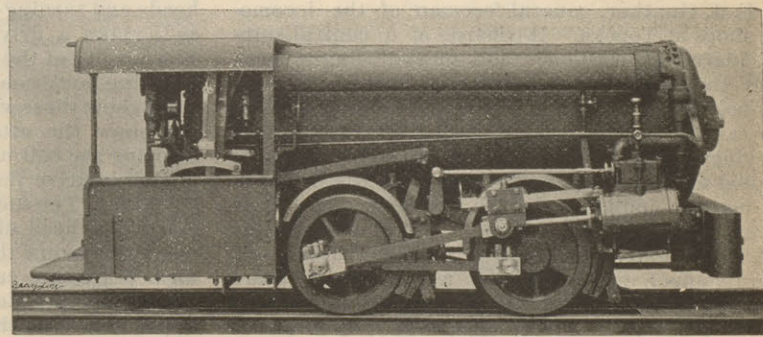


FIG. 5.—SIDE VIEW.

The minutes of the annual meeting of the club were read and approved. Letter from E. S. W. Moore at Wolverhampton, England, late of Cleveland, was read. Also various communications from D. H. Hurley and others from Washington, in regard to the metric system. The topic of the evening, "Smoke Prevention," was first taken up by Prof. C. F. Mabery, who was followed by various other members; the conclusions arrived at being that, in avoiding smoke, it was necessary to have sufficient boiler, grate and stack capacity, and to have, on the part of the fireman sufficient mental capacity. Mechanical stokers and shakers were recommended as saving both in labor and fuel.

The standing committees for the year were announced as follows:

Finance committee—James Ritchie, F. A. Coburn, Jos. C. Beardsley.

Library committee—A. Lincoln Hyde, John L. Culley, Jas. C. Wallace.

Program committee—Wm. H. Searles, chairman; J. R. Oldham, C. F. Schulz, Dayton C. Miller, J. G. Oliver, S. T. Dodd, F. S. Barnum.

The program committee reported as follows:

May 12. E. A. Sperry: Steam engine for direct connected electric generators.

June 9. Dr. C. O. Arey: Water supply and sewerage, as affected by the lower vegetable organisms.

July 14. James Ritchie: Inspection of structural steel from the standpoint of the engineer.

August 11. J. D. Varney: Solar work in land surveying and a new mechanical method for doing it.

Sept. 8. J. H. Richardson: A paper on architecture.

Oct. 27. C. L. Saunders: Gas producers and the mechanical handling of fuel for same.

Nov. 10. J. R. Oldham, N. A.: Structural steel of ships;

efficiency for repairing without diminution of strength.

Jan. 12, 1897. Prof. C. H. Short: Some problems for street railroading.

Jan. 26. J. R. Oldham, N. A.: Steamship propulsion and analysis of skin resistance at deep and shallow draft.

Feb. 9. Prof. C. H. Benjamin: Use of electric motors on machine tools.

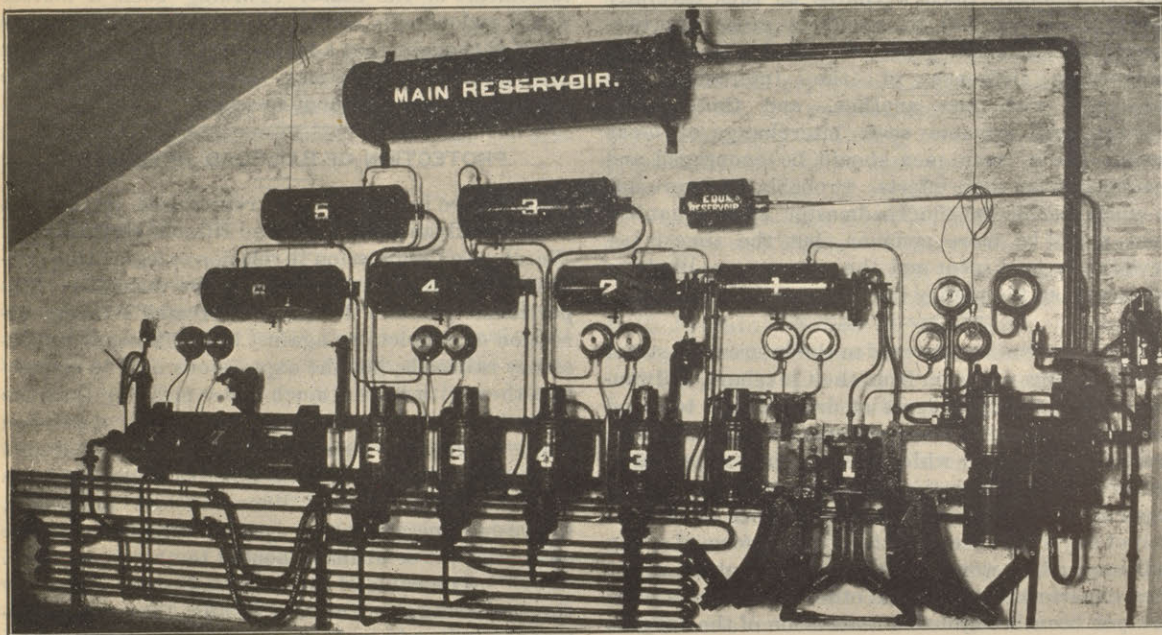
Feb. 26. Dr. Cady Staley: A paper on sanitary engineering.

March 9. Annual meeting: Address by the president.

April 12. Dr. Cady Staley: A paper on architecture.

AIR BRAKE INSTRUCTION PLANT—CENTRAL VERMONT R. R.

A photograph of the air brake instruction plant recently installed at the shops of the Central Vermont Railroad at St. Albans, has just been received from Mr. William Dobson, air brake inspector and instructor of that road. The arrangement of the equipment is shown in the accompanying illustration as it is fitted up in the upper story of one of the shop buildings. The apparatus consists of a complete engine and tender equipment with driver and tender brakes, equipment for four passenger and one freight car of the Westinghouse apparatus. These are arranged in the order named and are numbered accordingly in the illustration, the auxiliary reservoirs being numbered to correspond with the cylinders, and the piping is so placed as to be easily followed in instructing the men. The amount of piping



AIR BRAKE SCHOOL—CENTRAL VERMONT RAILROAD.

usually found with this amount of train equipment is provided, namely, 60 ft. of train pipe for the engine and tender and a cross-over pipe is provided at every forty feet with a corresponding cut-out cock for each passenger and freight brake. A conductor's valve is applied to the train pipe and a pressure retaining valve is fitted to the freight brake. Duplex gages are attached to each brake in such a manner as to indicate the pressure in the different parts of the apparatus whereby the reduction of pressure may be followed together with the effect of different piston travels. To operate the apparatus an improved engineers equalizing discharge valve is used attached to which is a similar valve sectioned in order to show the working of the parts. Other parts of the apparatus are sectioned for purposes of instruction. This apparatus is very compact and is well arranged with a view of studying the subject of air brakes.

PROGRESSIVENESS IN CAR AND LOCOMOTIVE DESIGN.

The following paragraphs are taken from the remarks of Mr. William Forsyth, mechanical engineer of the Chicago, Burlington & Quincy Railroad, in the discussion of the paper entitled "The Ninety and Nine," which was read at the February meeting of the Western Railway Club by Mr. J. N. Barr, and which was published in the RAILWAY REVIEW of February 22, of the current volume.

I will not attempt to discuss the general subject of Mr. Barr's paper, which relates to the overlapping interests of different departments of railroads, and which in our American practice he says are not working for the general good. I will take up only that part relating to locomotives and cars. The author says that some of the so-called advantages and improvements in railroad operations are of doubtful utility; and on the subject of equipment he says that the demands of the transportation department for larger engines and cars have been complied with to such an extent that many close observers to-day feel almost convinced that the economical limit in size and capacity of both cars and locomotives is exceeded in present practice. We get an idea of the author's views in regard to the weights of engines on the drivers in his discussion of Mr. McConnell's paper, printed in our January proceedings, on page 245, where he says: "I do not believe in these locomotives with 22,000 and 23,000 lbs. to the drivers. I do not believe in locomotives with 15,000 lbs. to the drivers." And on page 249 he says: "I would like to have that 15,000 changed to 12,000 in my remarks." Accordingly we have the author's ideas of proper weight on locomotive drivers as about 12,000 lbs. per wheel.

In looking over a catalog of the Baldwin Locomotive

Works, published in 1881, which is 15 years ago, I find that the maximum loads per wheel on the American type of engine, for drivers was 12,250 lbs.—on 10-wheel engines, 10,666 lbs.; on Moguls, 12,500 lbs.; and on 10-wheel engines, 11,750 lbs. The average of these is about 11,540. Now the average of 10 Baldwin engines exhibited at the World's Fair showed an average weight on drivers of 17,800 lbs., which is 60 per cent greater than those used in 1881.

Mr. Barr speaks also of using the happy medium, and says that we should use that in regard to the weights on drivers and loading locomotives, the size of rails and in almost all other points, and that the railroads that will be held up as examples of good management are those which act on this principle of using a happy medium. Now, if we had acted on this principle in 1881, and adopted 12,000 lbs. as a happy medium, we would not have made any progress in the improvement of locomotives from that time on, because the weight of the drivers is the index figure which determines the size of any type of locomotive. As soon as you commence to increase the boiler the weight on the drivers increases; we increase the wheels, the weight increases; and there is no use increasing the cylinder unless you increase the boiler. I think it will be generally admitted that all the increases which we have made in the size of boilers have always been attended with an increase in economy in coal.

Accordingly, the history, or rather the development, of the locomotive in size resulted in a gradual increase in weight on the driver, and at the present day we have, not only in this country, but in foreign countries, a gradual increase in the weight on the drivers. On the German State Railway we find 16,400 lbs. per wheel; on the Southern Railroad of France, 17,400; in England, on the London &

tions, there are still greater values to be obtained by the use of the broader and stiffer 100-pound rail.

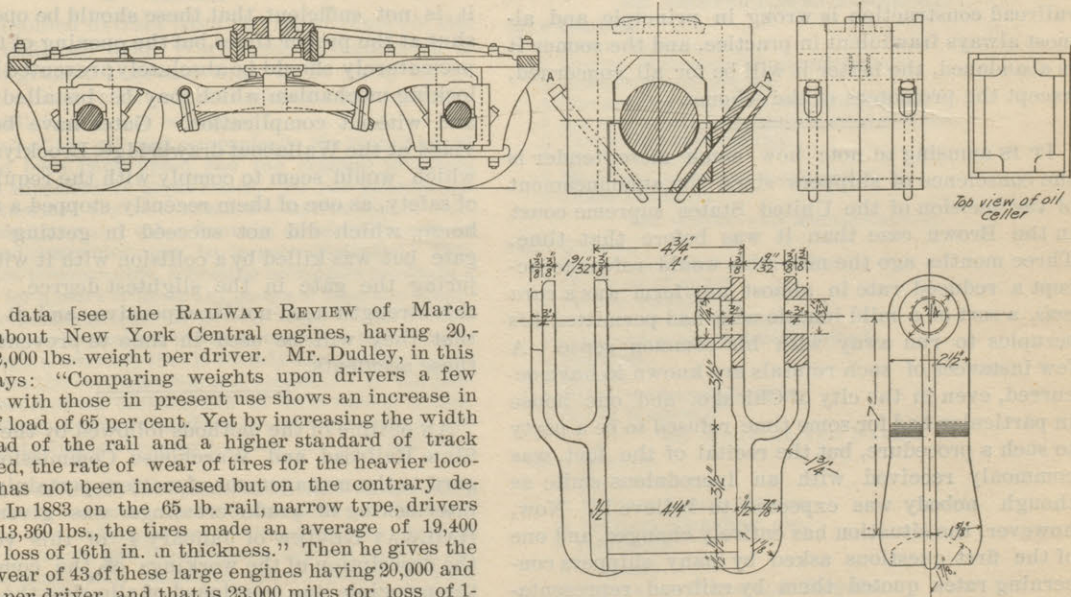
So much for the locomotives, and in regard to the larger cars I think that the best thing I can do is to refer to the report of the New York Railroad Club's committee on the question of large cars which most of you have probably read, but it applies to this subject directly. The committee shows that the increase in size of cars in this country has been about as follows in weight: In 1876 the capacity was 20,000 pounds, and the relation of the weight of the car to this capacity was 53 per cent; in 1882 the 40,000 lb. capacity cars came in and the ratio was 37 per cent; in 1889 60,000 lb. cars were introduced, that showed 31 per cent; and for 1896 they give the maximum capacity of cars as 80,000 lbs. where the same ratio is 31 per cent. The committee says in the body of the report "that operating economy demands that the number of tons of paying freight drawn by the engine shall be increased." This is a strong point in favor of the use of larger cars. The tendency in the future will be in the direction of increased capacity, concentrating the tonnage in fewer cars and shorter trains, and such an evolution will accomplish the following desirable results, viz: 1. Reduce the friction and atmospheric resistance. 2. Bring the moving load nearer to the engine, so that it can be more easily handled than the long train. 3. Reduce the empty car movement in the direction contrary to the heavy traffic stream. 4. Reduce the number of cars and number of locomotives for moving a given tonnage. 5. Reduce the switching service. 6. Reduce the payments for car mileage and the cost of inspection and repairs in proportion to the tonnage moved. 7. Increase the traffic capacity of main lines, of freight yards and terminals without building more main tracks and sidings.

Having presented these few facts and figures in defense of our modern construction—heavy cars and locomotives—it seems to me that Mr. Barr, in his opposition to these improvements stands almost entirely alone, and that he is really the lost sheep which needs the attention of the shepherd, and that those who have adopted the heavy rail and the powerful locomotives and large cars are the ninety and nine which are safely within the fold.

LINSTROM'S TRUCK-SPRING HANGER AND JOURNAL BOX.

Drawings and description have been received from Mr. C. Linstrom, master mechanic of the Yazoo & Mississippi Valley Railroad, of Vicksburg, Miss., of a new form of malleable iron truck-spring hanger for locomotives, and a truck journal box and cellar, provided a convenient locking arrangement for holding the cellar in place. These are both shown in the accompanying illustrations. The spring-hanger is shown partly in section, partly in elevation, and it will be noticed that provision is made for receiving the two equalizer bars upon the pin which passes through the top of the hanger and the spring seats itself upon the curved cross bar at the bottom of the hanger. Mr. Linstrom states that with this device he has entirely eliminated the twisting of the springs which he had experienced with wrought iron hangers. The difficulty which was found with wrought iron hangers was that they did not distribute weight equally on the spring bearing surfaces. This device is designed to take the weight equally from both truck equalizers and to assist them to hold their vertical positions by means of the jaws of the hangers.

The journal box is arranged with a view of locking the oil cellars in such a way as to render it easy to remove and replace them without the necessity of removing bolts or split keys. This fastening employs pins with heads, and these are passed downward at an angle through the lower corner of the journal box flange, and also through the corner of the cellar, as shown in the illustration. Bosses are cast upon the flanges of the boxes to form bearings for the heads



NEW SPRING HANGER AND TRUCK BOX.

of the pins. The locations of the pins and the method by which they hold the cellars in place is shown in the illustration, the pins on the inside faces of the boxes of the truck being raised to show how the cellars may be removed. It is obvious that this may be done quickly and also that the fastening for the cellars is secure. These devices are patented by Mr. Linstrom.

teresting data [see the RAILWAY REVIEW of March 14, 1896] about New York Central engines, having 20,000 and 22,000 lbs. weight per driver. Mr. Dudley, in this article, says: "Comparing weights upon drivers a few years ago with those in present use shows an increase in weight of load of 65 per cent. Yet by increasing the width of the head of the rail and a higher standard of track maintained, the rate of wear of tires for the heavier locomotives has not been increased but on the contrary decreased. In 1883 on the 65 lb. rail, narrow type, drivers carrying 13,360 lbs., the tires made an average of 19,400 miles per loss of 16th in. in thickness." Then he gives the average wear of 43 of these large engines having 20,000 and 22,000 lbs per driver, and that is 23,000 miles for loss of 1-16th in weight; and 23 of these engines, which ran over 100 lb. rails, showed an average mileage of 29,000 miles per 16th loss in thickness of tire.

It is interesting to see also that this investigation on tire wear is calculated to allow for the difference in increase in diameters of tires, and the figures are given based on the actual weight worn off, as well as the loss per yard in circumference per 1,000,000 tons rolling contact on the rail. The practical result of introducing the broad, stiff rail shows a decrease in wear of tires, frogs, rails and ties, and less expense of maintenance. In conclusion he says that this large rail marks an epoch in railroad progress; and that while the advantages have exceeded expecta-

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CHICAGO, SATURDAY, MAY 2, 1896.

THE lean years from 1893 have developed capacities, facilities, and endurances that would have remained unknown had it not been for the precipitation that befell all interests about that time. Vast liquidation has been effected. Reorganization of incorporated properties of all kinds has progressed with amazing rapidity. The return to substantial foundations has been steady. Meantime enterprise has been forecasting and planning. There never was as much projected work, and we might include, as much projected railway building, a fact we have often pointed out. The country has been preparing for a bound. The coke, ore, iron, steel, lumber and general manufacturing interests have been enlarging and drilling for it. It is evident that the world's financial capitol has enough idle capital to prosecute all the enterprises scheduled. When the work will begin is uncertain. Our newspaper writers love to promise great things "after election". Certain it is that we are in the upward trend towards better things.

MENTION is made in our news columns of a meeting recently held at Knoxville, Tenn., in which it was proposed to vote a subsidy of one million dollars in aid of railroad construction. It is to be hoped that if the county court should acquiesce in the request of this meeting and call an election for this purpose, that the voters of that section will defeat the project. The day has gone by when aid of this character is necessary to the building of any road. If it can be demonstrated there is sufficient business to justify the maintenance of a railroad, capital can be found to construct it. No doubt those interested in the project will resort to every possible means to convince the voters that their interests will be greatly enhanced by the building of the road. Possibly this is true, but it is also true that the line if built at all will be constructed as soon without the subsidy as with it. The voting of bonds in the aid of railroad construction is wrong in principle and almost always fraudulent in practice, and the sooner it is abandoned, the better it will be for all concerned, except the promoters of the scheme.

IT is amusing to note how much more tender is the conscience of shippers since the announcement of the decision of the United States supreme court in the Brown case than it was before that time. Three months ago the man who would refuse to accept a reduced rate in almost any form was a *rara avis*, a sort of a mild lunatic who had permitted his scruples to run away with his common sense. A few instances of such refusals are known to have occurred, even in the city of Chicago, and one house in particular had for some time refused to be a party to such a procedure, but the recital of the fact was commonly received with an incredulous smile as though nobody was expected to believe it. Now, however, the situation has entirely changed, and one of the first questions asked by many shippers concerning rates quoted them by railroad representatives is as to their lawfulness. But it is not so much the fact of the question as the reason given therefor that attracts attention. These shippers now profess a high regard for the law, and discourse volubly upon the benefits that are bound to follow the impartial administration of it; any one who would now accept a less rate than is paid by another, is to be regarded as little better than a swindler. This sudden awakening of the commercial conscience will

no doubt prove of much benefit, even though its source is directly traceable to the possible consequences growing out of the decision in the case referred to.

UNDER the caption "A Roadmaster's Division Track Association and How Conducted," Mr. Edward Laas, roadmaster of the East division of the Chicago & Council Bluffs line of the Chicago, Milwaukee & St. Paul Railway, recently described in the *Roadmaster and Foreman*, a method by which he had succeeded in interesting his men in their work, and in giving them an opportunity to benefit by the ideas of others of their own class, and also those of their superior in regard to the execution of their duties. This organization was formed about three years ago, and meetings are held semi-monthly, being governed by a constitution and by-laws and rules of parliamentary practice. The result is, as might be expected, seen in the quality of the work of the work of the men and in the intelligence with which they perform it. A favorite method is for a committee of three to prepare a list of questions on track work which is submitted to another committee of three as a basis for the preparation of a paper which is read and discussed at the next meeting. This leads to uniform methods throughout the division which are based to a large extent upon the result of the discussions. Such a course as this, carefully managed, cannot fail to result in great improvements not a small part of which lie in the broadening influence of the intercourse of the men with one another, and those roadmasters who promote such interchange of ideas among their men should be encouraged and commended for their efforts. Probably if it were not so much trouble for the roadmaster such organizations would be more common, but the time is believed to be well spent and the returns are likely to be more than temporary in character.

A CONTEMPORARY devoted to the interests of street railways takes occasion from the Cleveland, Milwaukee and Portland accidents at drawbridges to sound another note of warning against another terrible drawbridge disaster which is confidently expected to occur. It will be fortunate if such accidents do not occur soon and often, and in the absence of protection of any kind except in the doubtful form of a city policeman, it is wonderful that more trouble has not been experienced in this and other cities which have not yet been brought to a realization of the dangers involved by accidents occurring within their own limits. It was only recently that four electric cars which were waiting to cross a bridge after the passage of a steamer were seen to enter the bridge with intervals of only a few feet between them before the draw was locked in position, and the first car was upon the bridge before it had entirely stopped swinging. The fact that it remained upon the rails shows that the bridge must have been practically at a standstill, but that it was not locked at the time shows the carelessness with which such movements are made. What is needed is a set of gates or scotch blocks in the tracks, or both, constructed with sufficient strength to prevent the approach of cars within a dangerous distance from the edge of the draw, and it is not sufficient that these should be opened and shut at the proper times, but the opening of the gates prematurely should be absolutely prevented by interlocking mechanism which may be installed cheaply and without complication. Gates have been provided at the Wallabout drawbridge, Brooklyn, N. Y., which would seem to comply with the requirements of safety, as one of them recently stopped a runaway horse, which did not succeed in getting past the gate but was killed by a collision with it without injuring the gate in the slightest degree. Gates of this strength need not be expensive, and it is hoped that they will be used in time to prevent more of these accidents.

AN outline of the methods followed by the Illinois State Railroad and Warehouse Commission in regard to the management of matters pertaining to the interlocking of grade crossings was given in the RAILWAY REVIEW of January 4, of this year. In the description of the workings of the commission, the principle was mentioned of allowing the roads to use their own judgment as far as possible in connection with questions affecting the necessity for the application of interlocking apparatus. The commission has the power to enforce the construction and installation of safety appliances at crossings which may be deemed dangerous yet it has not been exercised, and the result is that the roads are voluntarily taking up the question and installing the apparatus at a rate which should be gratifying to the commis-

sion and for which the roads are to be commended. In the advance sheets of the report of the commission for 1895, the statement is made that of one hundred fifteen interlocking plants now in operation under the authority of the commission, but nineteen cases have been docketed for hearing and a number of these have been settled by agreement and without action by the board. The report speaks in testimony of desirability of the course which has been taken as follows: "The ability of the railroad companies to settle between themselves differences that have temporarily existed as to the division of the cost of construction, maintenance in operation of the devices proposed to be constructed, is satisfactory evidence of the unity of feeling as to the necessity of protecting trains from collision and disaster at grade crossings. The advantages have become so apparent from the standpoint of safety and convenience to the public and also to themselves that there are but few roads whose ability would warrant the expenditure that are not at least partially equipped with them." During last year fifteen new interlocking plants have been placed at grade crossings and six existing plants have been renewed and enlarged. This is a good showing considering the state of business and finance during the year, and is evidence that the commission is correct in the estimate of the position which interlocking apparatus holds in the minds of the officers of the roads. Forcing such a matter would undoubtedly add to the number of installations but it is thought that a factor of this importance in the operation of roads may safely be left with the roads themselves without coercion.

PROTECTION OF RAILROAD REVENUES.

Elsewhere in this issue is reproduced an extract from the advance sheets of the Illinois Railroad and Warehouse Commission in relation to legislation necessary to protect the interests of the railroads. The particular phase of the question treated is in the direction of restrictions against the building of unnecessary railroads, but the expressions used in connection therewith have a much wider meaning than the sense in which they are employed. The commission says, "Legitimate competition should be encouraged in every way possible, but competition upon the basis of constructing parallel lines in close proximity, where one line meets every public necessity, can give no permanent or ultimate benefit to the community. * * * The value of this (railroad) stock is fixed by the net earnings of the road issuing the stock, therefore the indiscriminate or unrestricted construction of new roads through a territory that is amply accommodated and which do not meet any public necessity, has the effect to depreciate the value of this stock, and the public, as well as the railroad companies, is made to suffer thereby." No argument is necessary in support of the soundness of this proposition. The building of unnecessary railroads has been a very fruitful source of evil in this country and had the restrictions which are already in force in some states and are now recommended by the commission for adoption in Illinois, been general throughout the country, it is probable that many of the railroads which have been made the subject of foreclosure proceedings would have attained a prosperous condition and their owners been spared heavy losses. The legislature of Illinois, and indeed of all the states, can not too soon make demonstrated public necessity a condition precedent to the building of any railroad.

But the phase to which it is now desired to direct particular attention relates to earnings. If it is admitted that the protection of railroad revenues warrants the restriction of unnecessary railroad construction because the public interest is best conserved by the prosperity of the roads, then it follows that railroad revenues should be protected from illegitimate attacks from any source. The commission well states that these revenues are unfavorably affected by the building of unnecessary roads. It might have stated with equal force that these same revenues were similarly affected by the illegitimate competition of existing roads; and it would seem that a railroad was entitled to as much protection in one case as in the other.

There is no more justice in allowing one corporation possessed of an existing road to ruin the revenues of another through the medium of illegitimate competition in rates, than there is for another corporation to create illegitimate or unnecessary competition by the building of an additional railroad.

If the foregoing proposition is correct, it would appear that something was needed in the way of legislation besides the power to restrict the building of unnecessary railroads. It is probable that the question as to what is a reasonable rate will remain unanswered for some years to come, but enough is now

known of railroad science to permit the determination of what may be called the boundaries of reasonable rates. That is to say, the maximum and minimum above and below which rates shall be declared to be unreasonable and therefore unlawful. To illustrate; it may not be possible to demonstrate that a rate of forty cents per hundred pounds on a given article from Chicago to Cairo, Illinois, is absolutely reasonable, neither too high nor too low, but it is sufficiently near the point of reasonableness to make it safe to say that anything below thirty-five cents on the one hand or above forty-five cents on the other would be unreasonable—the one to the road and the other to the public.

The introduction of this feature into the public regulation of the railroads of the country would do more to strengthen American securities throughout the world than any other legislation which could be proposed. Investors are fully aware that too often railroad earnings are used to influence market quotations in order that speculators may reap large gains. No one familiar with the inside conduct of railway operations but knows how extensively this method has been practiced. It is not too much to say that under our present laws any single person in control of a railroad of any size is the absolute master of the revenues of all the railroads in the same section of the country. It is true he cannot increase them except by agreement with other managers, but he can diminish them at his own will and pleasure. This power to ruin another's property without recourse should not be possessed by any man, and when to such a result is added the injury to public interest which necessarily attached thereto, the seriousness of the situation is apparent.

AIR AND ELECTRICITY.

Probably no factor which has ever been introduced into the manufacture and repairs of railway rolling stock has contributed more to the saving of hand labor than the employment of pneumatic appliances. Most of this air apparatus has been put in within the last four or five years, and the phenomenal manner in which the idea was caught up and put into practical operation by the different shop men shows that the advantages are real and that some satisfactory method of distributing power was needed. There is a tendency among mechanical officers to vie with each other in the number of applications which they make of pneumatic transmission, it being a matter of pride among many that they have more different kinds of air tools than their neighbors. Some have employed air motors and kindred machines to such an extent as to lead to their being charged with disordered intellects upon the subject. One can go into any of a half dozen shops which might be mentioned and find the "only original pioneer" in air tools. This may be taken as a satisfactory indication of the real value of pneumatic appliances in shop processes, and it would certainly be a serious calamity to be obliged to give up pneumatic power. It is not necessary to enumerate the processes in which no other power could be applied to do the same work for the same outlay in order to see that it is valuable. But there is a serious question raised in the mind of one who visits the shops where air is used most extensively, as to whether there is not a tendency to use this power in some cases where other methods are more direct and economical. It is not believed that the limit of usefulness has been reached, but there seems to be a need for calling attention to other methods or at least another method for use in special cases.

The extension of the distribution of air pressure about the shops is the natural result of the piping of yards wherein freight cars were repaired and once having an air pipe in a shop in connection with the outside system, it became very easy to add a piece here and there as some new work was found for it to do. Now the presence of piping systems generally scattered over an entire shop plant, places at hand the means for adding to the operations without serious outlay and in many cases without any outlay at all. Herein is the strongest hold which air power has, outside the fact that more different processes can be worked by it than by any other means. It possesses also the important requisite of enabling the consumption of power to absolutely cease when the machinery is stopped, for by the use of sufficient reservoirs the compression of air may be carried on at a nearly uniform rate which will admit of the compressors being operated most of the time under the conditions of maximum economy. Great fluctuations of the demand for power has disturbed these relations somewhat, yet it must be admitted that the ability to store the power in reservoirs is strong recommendation for the air

which is not enjoyed by electricity at this time, although with the development of a satisfactory storage battery the two forms will be nearly on a par in this respect.

The rapid progress in pneumatic apparatus has not admitted of the care and study necessary to design small air motors with a view of making them efficient. There is great need of a good air motor which is less a windmill and more an engine, and it is known that a number of experimenters are engaged upon this work at the present time. Air works very well in a steam engine or steam hammer, but the employment of better engines is believed to be a necessity which is becoming apparent generally, and the introduction of improvements in this direction will disarm the criticism which is now fairly made against wastefulness in operation of air tools. It is desired here to defend air from an unjust criticism to the effect that it is generally wasteful and necessarily so, and to show that beyond a doubt, for many services, it has not at the present time a superior. While it is unwise to place any limits upon the possible future development of electric power transmission, it is fair to say that at present it does not possess sufficiently strong attributes to warrant replacing air distribution. It has, however, a field of its own in manufacturing establishments employing machinery, and the danger already referred to is that its usefulness may not be seen clearly enough. In spite of the fact that air pipes are now in the shops, it will be found that in some cases an equipment of electric motors will pay, even if a new installation has to be made for the purpose, and especially in places where electricity is already used for lighting. Its presence should not be lost sight of in connection with the operation of special tools which are run during the night and when the main power plant is shut down, and which, on account of the location, can best be operated by electricity rather than extend an existing line of shafting a considerable distance. Mr. G. R. Joughins showed at the Master Mechanics' convention of 1894 that electricity could be applied to driving tools in a shop at about one hundred dollars per horse power, which, it is understood, includes the installment complete. Manifestly, if the power is present there are plenty of opportunities to utilize it in such ways as in driving large cranes, as well as in furnishing power for machines which are run continuously.

There is more danger in discouraging the extension of these air appliances than can possibly result from considerable extension of even wasteful methods of utilizing it and there is much to be gained over present methods by the adaptation of air to more shop processes. There is also danger that in following what may be a hobby, instead of the happy medium of using air when air is best and electricity when it is most applicable and hydraulic power for its specialties, that an even balance whereby the best results may be obtained will not be secured. There is no fault to be found with the pneumatic hobby riders thus far, but they should not forget that there are other good things besides air which under certain circumstances are better than air.

NECESSARY RAILROAD LEGISLATION.

The subjoined extract from the latest report of the Illinois Railroad and Warehouse Commission is worthy of greater currency than it is likely to receive if confined to its original context, and is therefore republished in our columns:

Nearly all of the railroad companies in the state have at some time been bankrupted, and the original investors have been subjected to great losses. To the general law which authorizes the unrestrained construction of railroads, bankruptcy and other financial embarrassments of the railroad companies may be largely attributed. This law enables irresponsible, scheming promoters to obtain a franchise for a mere trifle, and by means of false and fraudulent misrepresentations, as to the value of such franchise, to induce capitalists to invest money to build a new road through a territory that is already occupied by a road which meets the requirements and necessities of the public; the result of the construction of such road is a division of tonnage, undue reduction of rates, poor service, and in many instances bankruptcy to both old and new companies.

While it is true that the operation of these unnecessary roads has been continuous, yet the character of the service is poor and unsatisfactory to the public, the physical condition is unsafe, and the revenues derived from its operation so small that employees are compelled to wait weeks, and sometimes months, for their wages. These conditions give rise to constant complaints of poor train service to the commission, and however desirous the commission may be to remedy the evil, the way to it is so circuitous that it requires months and sometimes years to accomplish it.

Prior to the constitution of 1870, cities, towns, villages and townships incurred debts, which in the aggregate amount to a vast sum, to subscribe stock in railroads, or as donations, and to aid in their construction. In many instances heavy taxes have been laid to meet the interest on their bonds issued to pay for such stock. The value of

this stock is fixed by the net earnings of the road using the stock; therefore, the indiscriminate or unrestricted construction of new roads through a territory that is amply accommodated, and which do not meet any public necessity, has the effect to depreciate the value of this stock, and the public, as well as the railroad companies, is made to suffer thereby. Legitimate competition should be encouraged in every way possible, but competition upon the basis of constructing parallel lines in close proximity where one line meets every public necessity, can give no permanent or ultimate benefit to the public, and while the state should encourage competition, from which flow many public benefits, yet on the other hand it should not permit the construction of new lines where there are railroads enough to amply serve the public, and where there is not business sufficient to support additional roads.

Under the present incorporation laws of the state of Illinois, any number of persons, not less than five, may become incorporated as a company for the purpose of constructing and operating a railroad; under this law, more than 900 franchises have been granted for the construction of railroads. Many of the lines for which franchises have been obtained have never been constructed, but by reason of purchase, consolidation or lease only 117 proprietary and subsidiary lines are now in operation in this state.

The franchises in many instances have been obtained without any intention on the part of the promoters of carrying the project into execution, but merely for speculative purposes. This is manifest injustice to lines already established and in operation, and as the granting of a franchise alone does not conserve any public good, such certificates of authority should not be granted unless the proposed line of road meets some public necessity.

However aggressive the policy of railroad companies may have been in the past, it can no longer be successfully contended that they are beyond the power of legislative authority. It is therefore apparent that the action of the state and national governments tending to adjust the relations between the public and the railroads in their quasi public position should also, as far as practicable, tend to protect them in their vested rights.

As there can be no controversy as to these facts, and as the present eligibility of the lands of the state to the railroads already constructed is so complete and uniform, it seems clear that there should be legislative enactment restraining the construction of unnecessary and destructive new roads. This authority should be lodged in an impartial tribunal that will be prompted only by a desire to do equal justice to the corporation seeking recognition and the people.

We therefore recommend that a law be enacted to carry into effect the suggestion here made, believing as we do that it is in the interest of the people of the state.

A DECIMAL CLASSIFICATION FOR ENGINEERS.

The secretary of the Western Society of Engineers has sent out a bulletin in which is presented an arrangement for a decimal classification of the subdivision of the general subject of engineering, which has been prepared by the committee on professional papers of that society. The prime object of the arrangement is to produce a satisfactory classification for filing and cataloging of books, pamphlets and data which are found in every engineer's library, and also to assist the committee in so subdividing the subjects as to enable the members to cover the whole field of engineering in search of desirable papers.

The committee is composed of nine members, and in subdividing its work has adopted as a working basis "The Dewey System of Decimal Classification," each member of the committee taking charge of a division. The Dewey Classification has been followed closely through the first three figures, and the members of the committee have extended a fourth figure, as appears below, after careful consideration:

620 ENGINEERING.

General Work and Considerations.

621 MECHANICAL AND ELECTRICAL.

- 621.0 General.
 - 1 Steam engineering.
 - 2 Pumps, water machines and motors.
 - 3 Electrical engineering.
 - 4 Gas generation, machines and motors.
 - 5 Air machines, compressors, refrigeration.
 - 6 Transmission of energy.
 - 7 Machine designs.
 - 8 Machines, tools and conveyors.
 - 9 Other branches.

622 MINING AND METALLURGICAL.

- 622.0 General.
 - 1 Exploration and prospecting.
 - 2 Working of mines.
 - 3 Mining machinery.
 - 4 Chemistry and technology.
 - 5 Ores and crude materials mined.
 - 6 Refining.
 - 7 Metals.
 - 8 Other products of mining.
 - 9 Other branches.

623 MILITARY AND NAVAL.

- 623.0 General.
 - 1 Fortifications.
 - 2 Military Constructions.
 - 3 Military Signaling, etc.
 - 4 Ordnance.
 - 5 Gunnery.
 - 6 Submarine Mines and Torpedo.
 - 7 Naval Engineering and Architecture.
 - 8 Naval Armor.
 - 9 Other Branches.

624 STRUCTURAL.

- 624.0 General.
 - 1 Design, Stresses and Strains.
 - 2 Materials of Construction.
 - 3 Metal Structures.
 - 4 Foundations, Masonry and Concrete.
 - 5 Carpentry.
 - 6 Composite Structures.

- .7 Earth and Rock Work.
- .8 Painting and Preservation.
- .9 Other Branches.

625 RAILROAD.

625.0 General.

- .1 Organization.
- .2 Location and surveys.
- .3 Construction.
- .4 Operation.
- .5 Maintenance of way.
- .6 Rolling stock.
- .7 Power.
- .8 Signaling.
- .9 Other branches.

626 MUNICIPAL, SANITARY AND LANDSCAPE.

626.0 General.

- .1 Water supply.
- .2 Sewerage systems and sewage treatment.
- .3 Sanitation.
- .4 Streets and pavements.
- .5 Lighting.
- .6 Nuisances and cleaning.
- .7 Parks and roads.
- .8 Surveying.
- .9 Other branches.

627 HARBOR AND WATERWAY.

627.0 General.

- .1 Protection, sea walls, jetties, etc.
- .2 Docks, quays, etc.
- .3 Graving docks and ways.
- .4 Lighting and buoying.
- .5 Water feeders.
- .6 Rivers and canals.
- .7 Reclamation.
- .8 Mechanical appliances.
- .9 Other branches.

628 HYDRAULIC ENGINEERING.

628.0 General.

- .1 Sources of water supply.
- .2 Measurement of flow.
- .3 Water conduits.
- .4 Natural water power.
- .5 Reservoirs and dams.
- .6 Irrigation.
- .7 Land drainage.
- .8 Hydraulic appliances.
- .9 Other branches.

629 OTHER BRANCHES OF ENGINEERING.

The system is subject to much discussion and many opinions have been offered as to proper classification. Any classification will be found to interweave with any other, and so all must be more or less arbitrary.

It is desired to have all rational criticism on the subject before standardizing a classification for the society with recommendation for adoption to the profession at large. With this end in view the foregoing is published with the request that any person interested in the development of the subject communicate in writing, with the secretary of the society, suggesting any changes in the proposed classification and more particularly in proposing fifth and sixth figures for the same in any branch of work with which he may be familiar.

Mr. Henry Goldmark, secretary of the society has already received valuable suggestions in the extension of several of the branches and asks for communications from engineers in criticism and offering further suggestions to the end that a standard classification may be obtained which will reach at least the fifth figure. More will be said upon this subject in these columns later.

ABSORPTION TESTS WITH WOODLINE.

In our issue of February 29, of the current, volume an illustrated description was given of the method of preservation of ties by the application of "Woodline," and a report of some tests which were made at Pavonia, N. J., April 2, of this year, has just been received. This record shows the amount of the liquid preservative which is absorbed by black and white oak ties when immersed for varying lengths of time in a bath of the hot liquid. The tests were made by the aid of the large tank on the Pennsylvania Railroad which was illustrated in the issue referred to the following being a part of the report thereon by one of the party taking the records.

The ties were carefully weighed, both before and after treating, the temperature of the bath being also noted. Before beginning the experiments, it was ascertained by weighing one gallon of the hot liquid that its weight was 7½ lbs. The black oak ties used in the experiments had been left for two weeks in the room containing the boiler which supplies steam for heating the liquid in the tank. For the last five days of this time the temperature of the room ranged from 100 to 115 degrees. The ties were thus quite dry. Each one was carefully numbered and weighed, after which it was placed in the tank and left there a certain time. After allowing the surplus liquid, adhering to the ties when they were removed from the tank, to thoroughly drain off, the ties were again weighed, the difference in the two weights showing the amount of preservative absorbed.

The results for the ties from No. 2 to No. 15, inclusive, are given in the following table.

Number of Tie.	Temp. of Liquid	Weight of Tie-lbs.	Time of Immersion Min.	Quantity of Preservative absorbed—in lbs.	Average amount of preservative absorbed, in gallon
2	120 deg.	175.	6.	6	
3	121 "	173.	10.	4	
4	122 "	207.5	7.5	5	
5	123 "	180.	10.	4½	
6	123 "	181.	7.5	3½	
7	126 "	204.	10.	4	
8	128 "	249.	15.	4	
9	131 "	202.	15.	2	
10	134 "	183.	10.	2	
11	135 "	207.	10.	4	
12	136 "	243.	30.	5½	
13	137 "	204.	5.	2	
14	137 "	227.	5.	6	
15	138 "	179.	7.5	6	
Average	129 deg.	197 lbs.	10.6	4.18	0.55 gal.

The average results show an absorption of about half a gallon for a tie of 197 lbs. average weight. The exact figures are .55 gallon the average time being 10.6 minutes. The results indicate that in general the absorption is about half a gallon, and that in no case, even when the time was increased to 30 minutes, did it reach a gallon. This too, with ties that were artificially dried. An immersion of 15 minutes with air-dried ties, would probably result, on an average, in the absorption of about ½ gallon of the liquid, which is deemed sufficient by the makers to effectually prevent decay. With the bath at a higher temperature—say 150 degrees—a higher rate of absorption could have been secured.

The amount of preservative wasted by draining from the ties after removal from the tank was large, probably over one quart. This waste should be obviated by the use of a drainage rack.

Tie No. 1 is omitted from the first table. It weighed before treating, 207.5 lbs., and was left in the bath for 3 hours, during which time it absorbed 10½ lbs. This indicates an extremely high penetrative power on the part of the preservative.

Experiments were made on ties previously treated as follows: Half a tie, treated six weeks before, for 15 minutes, was left in the bath 15 minutes longer, the increase being ½ lb. Tie No. 2, gained 2 lbs. on being retreated for 10 minutes. Tie No. 3 gained ½ lb. on retreatment for the same length of time. This indicates the fact that the greater portion of absorption occurs in the first 6 to 7 minutes, an important item in computing costs of labor.

Four white oak ties, taken from a pile where they had lain in the rain for two days, were treated as shown in the table below. Their absorption was good considering their wet condition.

Number of Tie.	Temperature of bath.	Weight of Tie—lbs.	Time of Immersion Min.	Quantity absorbed in lbs.
1	148 deg.	209	14	2.5
2	148.5 deg.	198	12½	1.0
3	149 deg.	177	17	4.0
4	149 deg.	211	16	6.0
Average	148.8	198.7	14.8	3.4

The chief value of these tests beyond showing the properties of woodline for entering wood without the application of pressure, is that the element of time may be figured from them in getting at the labor cost of preservation of wood by this process. It is seen that a long immersion is not necessary and the tests corroborate the results of the practical tests which were made in the Camden yard of the Pennsylvania, in which the ties received the preservative solution by the application of a brush as if it were paint. Reference may be made to the RAILWAY REVIEW of the date mentioned for the conditions under which black oak ties gave twelve years of service in wet soil in that yard, where the life of untreated ties was but one-fourth of that time.

NEW HYDRAULIC JACKS, BY WATSON & STILLMAN.

The three designs of hydraulic jacks shown in the accompanying illustrations have recently been added to the list of the equipment furnished by the W. & S. Hydraulic Machinery Works of New York, of which Messrs. Watson & Stillman are proprietors.

The design shown in Fig. 1 was made in response to the demand for a jack with a large base under the claw, and until the arrangement shown was determined upon there was no jack in the list which could be considered satisfactory. Attempts had been made to produce such a tool, but the difficulty experienced

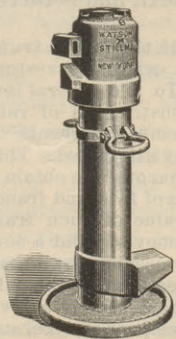


FIG. 1.

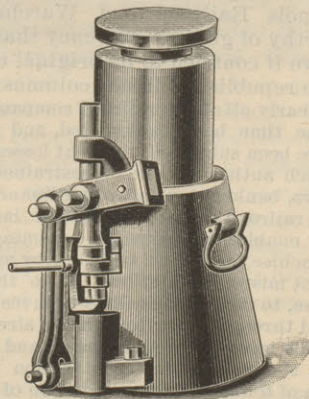


FIG. 2.

was that too short a hold had been taken upon the cylinder, and the cylinder had been crushed in or else the thread had been stripped. A good hold, however, has been secured with this type, and the difficulties mentioned have been overcome. These jacks are furnished in capacities of 10, 15 and 20 tons, weighing respectively 125, 175 and 225 lbs. They will all raise 10 inches.

The type shown in Fig. 2 was added to the list to fill a requirement for a tool of moderate capacity cheaper and simpler than the type having two complete racks and pinion pumps, and to give freedom of working position than is possible when the jack has to be set so that two pumps can be operated. The pump is of the same form as that which has been used for some years on the well known "Vee-

land" jacks, by these makers, in which the small piston works inside of a larger one, and in which a latching clutch is provided upon the large piston which throws it into or out of action. The large piston will exert a pressure one-third as great as the smaller, and moves correspondingly faster. This type is furnished in sizes of 60, 100 and 125 tons capacity, weighing from 380 to 700 lbs.

A double piston horizontal jack is shown in Fig. 3, which is equipped with a rack and pinion return ac-

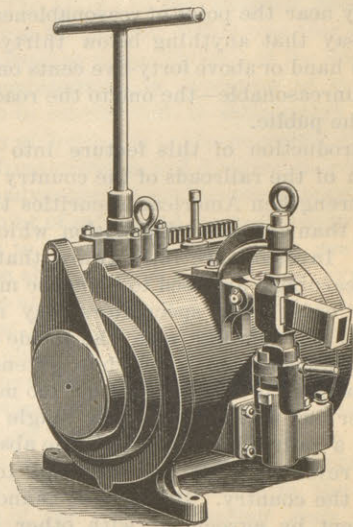


FIG. 3.

tion to the ram. The pump of this jack is similar to that shown in Fig. 2, but differs in detail owing to the form of attachment to the jacks. The speed of the jack is changed to three times greater than the slowest, and its power to one-third of the lowest by the action of a clutch which puts the large piston in operation. The illustration shows the appearance of the 200 ton size. These are made in sizes varying from 60 to 200 tons, all with a movement of 12 in., and weighing from 315 to 650 lbs. The length of the 60 ton size is 22 in., and of the others 23 in. These three types are constructed with the strength of parts and care in workmanship which characterizes the product of these works, which is sufficient assurance as to their capability of meeting the exacting requirements of the rough work in which such tools are employed.

DUCTILE CAST IRON.

The East Chicago Foundry Co., with works at East Chicago, Indiana, has been experimenting for a long period with a new process for making ductile iron castings which have every appearance of being excellent wrought iron, as judged by the manner of working under the hammer. The process has been carried beyond the experimental stage and the company is prepared to furnish castings from 10 lbs. and under up to five tons in weight. A recent visit to the rooms of the company in the Rookery building, Chicago, proved highly interesting to a representative of the RAILWAY REVIEW. A large number of castings were seen, some of them very difficult to make, and all were of good quality. Among the most interesting were spur gears and pinions, one of which was shrouded upon one side; a set of three crank shafts, a chain of links about three inches in length made of stock about ½ in. in diameter, the links of which were cast separately, scarfed in the mold, and afterward welded up by hand to show that the material will weld satisfactorily. A number of small castings were drawn down under the hammer and tied into complicated knots to show the ductility of the metal. The material works well upon the lathe, as was shown by shavings which were exhibited. The tensile strength of the material is stated by the makers to be from 60,000 to 80,000 lbs. per sq. in. The record of the corresponding elongations cannot be given at this time, but they will be published later in these columns. From the appearance of the castings seen there seems to be no doubt of the ability of the company to produce sound smooth work of best quality, having at once the adaptability of taking intricate forms together with the best attributes of wrought iron. The process is a secret one, and not even the base from which the material is made is known to others than the manufacturers. The office of the company is 716, The Rookery, and the officers are: Mr. L. Laflin, president; Mr. John P. Laflin, secretary and treasurer, and Mr. H. A. Keith, manager.

Association of Engineers of Virginia.

The regular informal monthly meeting of the association was held April 15, 1896, with President D. C. Humphreys in the chair. H. R. bill 7,251 to fix the standards of weights and measures by the adoption of the metric system of weights and measures was taken up and discussed. On motion the secretary was instructed to get at once a letter ballot from the members of the association as to whether they favor the passage of the bill or not, and to inform the senators and representatives of our state of the result.

Senate bill 2,301 to establish engineering experimental stations in connection with the college established in the several states under the provision of an act approved July 2, 1862, and acts supplementary thereto, was taken up and discussed, and on motion the secretary was in-

structed to get the opinion of the members by letter ballot and report results as on H. R. bill 7,251.

H. R. bill 3,618 to organize and increase the efficiency of the personnel of the navy to increase the usefulness and numbers of the corps of naval engineers; to induce the scientific institution to provide a naval engineering reserve for time of war; to establish a naval engineering experimental station, and to encourage the study of the mechanical arts and sciences, and particularly that of naval engineering in the technological colleges of the country, was taken up and discussed, and on motion the secretary was instructed to proceed as with the other two bills. The subject for the evening, "Engineering Ethics," was called, and opened by Prof. L. S. Randolph of Blacksburg, who showed clearly the necessity for some code as well as the difficulties of making and enforcing it. This discussion was very generally entered into by those present, all seeming in favor of establishing some standard for the guidance as well as the protection of the profession. The directors have decided to have the summer meeting at Pulaski, Va., June 26 and 27. Detailed information of arrangements will be furnished later. The entertainment committee desire papers from the members. Send subjects to the secretary. JOHN A. PILCHER, Secretary.
Roanoke, Va., April 16, 1896.

THE STEAM BOILER PLANT OF THE NATIONAL ELECTRICAL EXPOSITION.

In preparing for the exhibition of electrical machinery and appliances to be held in New York, May 5, 6 and 7, which includes practically everything of consequence in this line, the National Electrical Exposition Company decided that such an exposition would not be complete without a steam boiler plant which is completely up to date, and a special committee was appointed to secure a strictly modern plant which would include only the latest appliances in the market. The improved Root water tube boiler, manufactured by the Abendroth & Root Manufacturing Company, of New York, was selected to furnish all the steam used at the exposition, there being two equal units forming one battery of five hundred horse power of boilers. The anthracite automatic stoker, manufactured by the Wilkinson Manufacturing Co., of Bridgeport (Montgomery county), Penn., was selected to handle the coal supplied to the fire. The coal, after being dumped at some distance from the boilers, in the rear, is taken by the C. W. Hunt coal conveyor and carried along the side and a little past the front of the boilers where it is elevated to a point near the ceiling from whence it is delivered through tubes to the hoppers of the stokers, and from that point it is fed uniformly down the inclined grates, burning on its way and reaching the foot of the grates as ash, and is finally dumped into the ash pit below. The Hunt conveyor next takes the ash and carries it back to a dumping place some distance in the rear of the boiler, where it is deposited automatically.

The pump supplying feed water to the boilers is by the H. R. Worthington Company. It will be driven electrically by one of the Crocker-Wheeler Company's pump motors. The pump is one of the "steep pattern" and combined with its motor presents a novel and neat appearance. Two of the Root feed water regulating devices, manufactured by the Abendroth & Root Manufacturing Company, of New York, will work in connection with the boilers and the feed pump, starting the pump automatically when the water level in the boiler falls below its proper level and again stopping the pump when the water in the boiler tends to rise above its normal working level. The Locke Damper Regulator Company, of Salem, Mass., has applied one of its damper regulators which completes the entire automatic equipment. So safe and so simple is the entire operation of this plant, that it has been decided to put it in charge of a woman to show conclusively that if steam users will put in the best of everything, and if they will equip their plants in an up-to-date manner throughout, they will become so simple in operation that expert firemen will not be required.

The pressure carried by the boilers will be 125 pounds. This pressure will be carried along the main steam piping to a point just beyond the first engine and there it will be reduced by a Foster reducing valve to 90 pounds, at which pressure it will be carried to all of the other engines on exhibition. It will be interesting to follow the steadiness of the working of this reducing valve. This may be done by means of the exhibit of the Ashcroft Mfg. Co., near by, where two Edison recording gauges will be in operation, one recording the pressure of steam at the boiler and the other gauge recording the pressure on the low pressure side of the reducing valve. The boilers are equipped with steam gauges manufactured by the Ashcroft Mfg. Co., and with nickel seated pop safety valves made by the Consolidated Valve Co., both of New York and Bridgeport, Conn.

The visitor cannot fail to be struck with the excellent finish of the boilers which have been designed to include utility, durability and elegance in outline. The exhaust piping from the engines will probably interest many of the visitors to the exposition as it has been used by many electric light companies. This is the spiral riveted pipe made by the Abendroth & Root Manufacturing Company, of New York. The battery of improved Root boilers used at this exposition is in exact duplicate to the twelve batteries of boilers used at the tunnel plant of the Baltimore & Ohio railroad in Baltimore Md. A

fine, large sized photograph of this plant will be seen on the wall near the boilers. The engines on exhibition will all be directly connected with generators with two exceptions, which will be connected by belting. The exhaust from the engines, twelve in all, will be passed through a Goubert feed water heater and then sent through the spiral riveted exhaust pipe, placed outside of the building, to a point above the roof. All the feed water used will pass through this heater thus supplying the boilers with a bountiful supply of water heated to nearly two hundred and twelve degrees. Two concerns share the steam pipe covering work, one putting on Keasbey's magnesian sectional covering while the other applies Gilmour's asbestos covering.

Messrs. Watson & Stillman, proprietors of the W. & S. Hydraulic Machinery Works, 204-20 East Forty-third street, New York, have sent out under date of February, 1896, a 40-page standard size catalog of improved hydraulic jacks, including screw and lever jacks, etc. The ground covered by the jack lists which have previously appeared from these works has been gone over again and the entire matter of the former catalogs has been reset for the standard size, and new sizes have been annexed. A number of new designs have been added, among which are a large round base claw jack, a double piston outside pump vertical hydraulic jack, and a horizontal hydraulic jack with a double piston pump and rack and pinion return action to the ram. The first mentioned of these designs was added to fill a demand for a jack with a large bottom under the claw without producing a tool which would have too short a hold on the cylinder. In the arrangement produced a good hold has been secured and jacks arranged for lifting from ten to twenty tons. The second mentioned design has been produced to fill a demand for something cheaper than the type having two complete rack and pinion pumps and to give more freedom of working position than is possible when the jack has to be set so that two pumps can be operated. The pump is the same which has for some years been in use on the well known Vreeland jack, in which the small piston works inside of a larger one and a latching clutch, operating on the larger one, throws it in or out of action. The large piston will exert a pressure one-third of that of the smaller and has a movement three times faster. These tools are made in sizes from 60 to 125 tons. The third design mentioned differs from other horizontal jacks in respect to the rack and pinion feature which is used to draw the ram back to its closed position the speed of the jack is changed three times greater and its power to one-third the maximum power by the action of throwing the clutch so that the large piston is put into operation. These are made in capacities of from 60 to 200 tons.

TECHNICAL MEETINGS.

Annual convention Master Car Builders' Association, June 17, Saratoga, New York.
Freight Claim Association, May 6, Chicago, Ill.
Association Railway Claim Agents, May 27, Monongahela House, Pittsburgh, Pa.
International Association Car Accountants, June 9, Cleveland, Ohio.

Annual convention American Master Mechanics' Association, June 22, Saratoga, New York.
Association American Railway Accounting Officers, May 27, New York City.

Association Railway Telegraph Superintendents, June 17, Fortress Monroe, Va.
American Association General Baggage Agents, July 15, Philadelphia, Pa.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p. m., at the House of the Society, 127 East Twenty-third street, New York City.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E. M., Albuquerque, N. M.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each month, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Thursday in each month, at 8 p. m., at 12 West thirty-first street, New York City.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Railway Signaling Club holds its meetings in Chicago, Ill., on the second Tuesday of January, March, May, September and November. G. M. Basford, secretary, 818 The Rookery.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Western Foundrymen's Association holds its meetings on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnston, 1522 Monadnock building.

The Technical Society of the Pacific Coast has a month y meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Engineers' and Architects' Club of Louisville has a monthly meeting on the second Thursday in each month, at 8 p. m., at the Norton building, Fourth avenue and Jefferson street, Louisville, Ky.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumberland Publishing House, Nashville, Tenn.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

PATENTS ON RAILWAY APPLIANCES.

[The following list of patents granted for inventions relative to railroad appliances for the week ending April 28, is reported especially for the Railway Review, by Chas. L. Sturtevant, patent attorney, Washington, D. C., from whom printed copies can be obtained for 15 cents each.]

Andrews, Samuel S., assignor of one-half to C. L. Joy and C. G. Cox, Grand Junction, Iowa, mailbag catcher and crane, 559,317.
Boyer, Harry L., Monroe, Mich., car coupling, 559,097.
Buhoup, Harry C., Chicago, Ill., assignor to McConway & Torley Company, Pittsburgh, Pa., car coupling, 559,322.
Condon, William F., Saginaw, Mich., safety car brake, 559,121.
Dreisbach, Amos M., assignor to L. Corelle, Cabel, L. and G. Frometter, and J. Kaseman, Shamokin, Pa., railway switch, 559,268.
Fraser, Arthur C., Brooklyn, N. Y., metallic railway tie and rail-fastening therefor, 558,939.
Grover, Henry M., assignor of one-half to J. H. Niles, Anoka, Minn., car seal, 559,328.
Hartwell, Harry, Johnstown, Pa., assignor to Johnson Co., Lorain, Ohio, railway crossing, 559,284.
Hoffmann, Ernst W. G. C., Charlottenburg, Germany, assignor to Siemens & Halske Electric Co., of America, Chicago, Ill., eccentric mounting for electric vehicle axles, 558,953.
Hood, Chas. O., Central Falls, assignor of one-half to R. Bliss Manufacturing Co., Pawtucket, R. I., folding gate for cars, 559,331.
Kindl, Frederick H., Pittsburgh, Pa., car truck, 559,292.
Munson, John H., assignor of two-thirds to W. F. Roberts and J. E. Merritt, Chicago, Ill., electric railway conduit, 559,105.
Rice, John W., assignor of one-half to D. B. Wesson, Springfield, Mass., car brake mechanism, 559,344.
Schmick, Henry J., assignor of three-eighths to F. R. Wagner, Hamburg, and J. M. Kutz, Mahanoy City, Pa., combined freight and dumping car, 559,222.
Timms, James, Columbus, Ohio, car coupling, 559,005.
Tirmann, Hugo, assignor to B. Patterson, Cleveland, Ohio, track sanding device for locomotives, 559,006.
Tirmann, Hugo, assignor to B. Patterson, Cleveland, Ohio, track sanding device for locomotives, 559,007.
Van Dorn, James N., and C. G. Seaman, Spokane, Wash., car coupling, 559,235.
Weber, Peter, assignor of one-fourth to J. Heid, Pittsburgh, Pa., manufacture of railway car axles, 559,239.
Williams, Geo. B., La Crosse, Wis., assignor to Westinghouse Air Brake Co., Pittsburgh, Pa., engineer's valve for fluid pressure brakes, 559,243.
Williams, John S., assignor of one-half to T. Milwee and C. Inns, Krebs, I. T., car coupling, 559,245.

PERSONAL.

Mr. Thomas H. Noonan has been appointed general manager of the Continental Fast Freight Line at Cincinnati.

Mr. William H. Taft has been appointed superintendent of motive power of the Boston & Albany, with headquarters in Boston.

Mr. Bryan Snyder has been appointed assistant general freight agent of the Atchison, Topeka & Santa Fe, with headquarters at Dallas.

Mr. B. J. Jackson has been appointed division freight agent of the Valley division of the Baltimore & Ohio, with headquarters at Staunton, Va.

Mr. Burt Masson, who has been connected with the Chicago & Grand Trunk in the capacity of passenger agent, will sever his connection with the road May 1.

Mr. J. C. Lee, assistant division superintendent of the western division of the Michigan Central, located at Michigan City, has forwarded his resignation to that company.

Mr. H. K. Gannon has accepted the appointment of contracting freight agent of the Erie lines for St. Paul and Minneapolis, with headquarters on the sixth floor of the Pioneer Press building.

Mr. Robert Potts, has been appointed general freight and passenger agent of the Southern R. at Raleigh, N. C. Mr. Potts is a brother of Mr. John D. Potts, general passenger agent of the Chesapeake & Ohio road.

Mr. James Veitch, division freight and passenger agent of the Chicago, Milwaukee & St. Paul at Kansas City, died on Sunday, in Kansas City. He was at one time connected with the Indiana, Bloomington & Western.

Messrs. W. A. Merryday of Palatka and A. S. Pendleton of Valdosta were recently elected directors of the Georgia Southern & Florida in place of Messrs. John Gill of Baltimore and C. L. Bartlett of Macon, resigned.

Mr. P. A. Grant, for nine years in the auditor's office of the Western New York & Pennsylvania Railway in Buffalo, N. Y., has departed for St. Paul, Minn., to accept a position as traveling auditor with the Great Northern Railway.

Mr. S. E. Kirk, commercial agent of the Cincinnati, Jackson & Mackinaw Railroad, has been in Detroit this week for the purpose of establishing a permanent office for his company at that place. The company will make a bid for the southern freight business.

On April 29 Judge Woods appointed Mr. George T. Jarvis receiver of the branch of the Louisville, Evansville & St. Louis between Mount Vernon and St. Louis. Mr. Jarvis filed his bond for \$25,000 and appointed W. L. Taylor of Indianapolis general attorney.

Mr. W. A. Heister has resigned his position as road-master of the Buffalo division of the Erie. Mr. Heister's retirement was voluntarily and his successor will be Denison Fairchild, a civil engineer, who at one time served the Erie. This change goes into effect at once.

On May 1, Mr. R. H. Wallace will begin work as general agent of the passenger department of the Erie at Cleveland, succeeding Mr. M. L. Fouts, recently deceased. At the same time Mr. F. A. Beatty will take the position of traveling passenger agent which Mr. Wallace leaves vacant.

President R. A. Lancaster, of the Georgia Midland, announces the following appointments: Mr. C. W. Chears, general manager; Mr. T. S. C. Howard, auditor and treasurer, Columbus, Ga.; Mr. N. D. Lancaster, secretary, New York; Mr. Clifton Jones, general freight and passenger agent, Columbus, Ga.

Mr. W. A. Stinchcomb, general superintendent of the Jamestown & Erie, will retire on May 1 and go to Nova Scotia to superintend the construction of the Nova Scotia Southern road. Mr. E. T. Haines, vice president of the Jamestown & Erie, will manage the road until a successor to Mr. Stinchcomb is appointed.

Mr. Charles H. Doebler, master mechanic of the Michigan division of the Big Four, with headquarters in Wabash, was this week appointed master mechanic of the Eastern division of the Wabash Railroad, with headquarters at Fort Wayne. His appointment is effective May 1. Mr. Doebler succeeds Mr. F. W. Morse, who goes to the Grand Trunk.

Mr. Henry M. Keim, who resigned as an official of the Cleveland Terminal & Valley R. Co., April 1, held four offices. He was director, vice president, secretary and treasurer. These offices have just been filled by the board of directors, and Mr. S. T. Everett has been elected vice president, Auditor J. Bartol director and secretary, and Mr. F. E. Rittman treasurer.

Mr. H. F. Bickel of Lima, Ohio, superintendent of the Sandusky division of the Lake Erie & Western, has been appointed assistant general manager to succeed Mr. George P. Jarvis, resigned. Mr. S. R. Kramer of the Peoria division succeeds Mr. Bickel. Mr. H. A. Boomer, formerly of the Clover Leaf, takes Mr. Kramer's position. The changes are effective at once.

Mr. George Deming, who has for many years filled the position of traveling passenger agent of the Plant System, has been retired by B. W. Wrenn, passenger traffic manager. Reduction of expenses is given as the cause for the retirement. Mr. Deming is recognized as a faithful man and undoubtedly will soon be working for some other railroad. He will leave the Plant System on May 1.

The New Orleans & Western road has appointed Mr. G. McD. Nathan as auditor, the appointment having taken effect. Mr. Nathan is an old New Orleans boy, but comes to this position from Atlanta, where in the office of the commercial agent of the Southern Pacific, he has been serving for some time. Mr. Nathan, although quite a young man, was for some time connected with the Texas & Pacific road.

The annual meeting of the stockholders of the Union Pacific Railway was held at Boston, Mass., on April 29. The old board of directors was re-elected with the exception that Alex. Miller, secretary and assistant comptroller of the company, was chosen to succeed S. Endicott Peabody, while George Q. Cannon, of Salt Lake City, was elected in the place of James Sharp as a representative of the Salt Lake interests.

Although not officially announced, it is said that Mr. L. R. Brockenbrough, who was at one time assistant general freight agent of the Big Four, with headquarters at Columbus, but who has recently been traffic manager of the Ohio Southern & Cleveland, Akron & Columbus roads, on the first of next month takes service with the Baltimore & Ohio. He is to be general agent of the company, with headquarters at Cleveland, O.

Mr. W. W. Finley, formerly commissioner of the Southern States Passenger Association, and since then third vice president of the Southern R., in charge of the traffic of the company, has resigned his position and returned to the Great Northern R., with headquarters in St. Paul, where he assumed the position of first vice president. Mr. Finley before coming south was general traffic manager of the Great Northern, and is reckoned among the country's best railroad men.

Mr. Thomas S. Timpson, who since December, 1892, has been eastern passenger agent of the Lake Shore & Michigan Southern road, has been appointed general eastern agent of the company, with headquarters at 221 Main street, Buffalo, N. Y. Mr. Timpson first entered railway service in 1866 with the Northern Transportation Co., since which time he has held various positions with the White Line (fast freight), Missouri, Kansas & Texas, Big Four, Indianapolis & St. Louis, Toledo, St. Louis & Kansas City, which road he left to enter the service of the Lake Shore.

An official circular has been received announcing the appointment of Mr. C. K. Wilber, now western passenger agent of the Lake Shore & Michigan Southern road, to the position of assistant general passenger agent with headquarters at Van Buren street station, Chicago. Mr. Wilber was born at Buffalo, N. Y., and first entered railway service with the Chicago & Pacific road in 1877 as clerk in the general freight and passenger office, which position he filled until 1880, when he became chief clerk of the passenger department of the Indianapolis, Decatur & Springfield at Indianapolis. For one year—March 1881 to March 1882—he had charge of forwarding supplies for construction for the Canadian Pacific, going then to the Union Pacific as traveling passenger agent with Michigan territory. In 1887 he was made city passenger and ticket agent for the Lake Shore at Chicago, being promoted the next year to the position he now leaves.

Mr. W. W. Peffers, assistant auditor of the old New York, Pennsylvania & Ohio road, will retire May 1 to enter private business in Cleveland. In speaking of his resignation the Cleveland Leader says: "Mr. Peffers is in point of service the oldest official on the road. He began his railroad work in 1869 as a clerk in the engineering department, then located at Meadville, Pa. He served in various capacities, and in 1880, when the officers came to Cleveland, he entered by choice the auditing department, where he has ever since remained. Mr. Peffers is now closing up the books of the old Nypano company, and delivering the property to the new Erie company of the same name. He is the last old guard of the famous old Nypano, entered service in its early years and terminates his railroad career with its expiring breath. Mr. Peffers has formed relations which will keep him a resident of Cleveland."

Mr. William McWood is appointed superintendent of car department, of the Grand Trunk system, and will have charge of the construction and maintenance of passenger and freight car equipment, with headquarters at Montreal, P. Q. Mr. Geo. W. Vaux, formerly excursion clerk of the general passenger department, is to be chief clerk of the road. This is a substantial advancement for Mr. Vaux, who has been with the company for fifteen years. Mr. D. O. Pease, district passenger agent of the Grand Trunk at Bonaventure station, Montreal, is to have charge of the business east of Kingston, in Canada, while Mr. Dickson, district passenger agent at Toronto, will have charge of the business west of Kingston. The Boston passenger office of the Grand Trunk has been abolished, and Mr. N. Grace, who formerly represented the company there, will be retained in the company's service. Col. D. S. Wagstaff, who for several years has held the position of district passenger agent, with headquarters at Detroit, will be transferred to Cincinnati, where he will assume the duties of general southern passenger agent of the Grand Trunk. It is believed that the office of district passenger agent will be abolished. Mr. Ben Fletcher will attend to passenger matters in Michigan and Ohio.

RAILWAY NEWS.

Calumet & Blue Island—Chicago, Lake Shore & Eastern.—An official circular has been issued by the Calumet & Blue Island R. Co. as follows: "Notice is hereby given that, commencing with the first day of May, 1896, the railways which are now operated by the Calumet & Blue Island R. Co. will be thereafter operated by the Chicago, Lake Shore & Eastern R. Co. All claims and demands owing to the former company will be paid and collected by the latter company, and all the floating debts and obligations of the former company will be paid by the latter company." This circular is accompanied by another from the Chicago, Lake Shore & Eastern, which says: "All officers and employees of the Calumet & Blue Island R. Co. are hereby retained in the service of this company until further advised."

Chesapeake & Ohio.—The negotiations which have been pending for some time between the Chesapeake & Ohio road, and the city authorities of Richmond, Va., are about completed. Certain street rights and other privileges are to be allowed the railroad company, and work will soon begin on extended improvements. It is said that the railway company expects to spend about \$2,000,000 on the improvements.

Chicago & West Michigan.—The following circular has been issued to the bondholders of the Chicago & West Michigan R. Co. by the board of directors: "Business still continues so dull in Michigan that the directors are again compelled to resort to the payment in cash of half a coupon only of those maturing May 1 and June 1 respectively. They accordingly offer to the holders of those coupons one-half of the amount of their coupons in cash and the other half in scrip of the company, to be called 'coupon scrip,' payable in ten years from date with interest at 5 per cent per annum, payable semi-annually, the company reserving the option to prepay the scrip at any time on 60 days' notice, or to buy the same in the open market at any time, and agreeing that no dividends shall be paid on the stock until the company shall have paid or offered to pay all the said coupon scrip. Holders of coupons of Chicago & North Michigan bonds, maturing May 1, 1896, and of Chicago & West Michigan bonds, maturing June 1, 1896, are requested to present them at this office at their maturity and receive one-half the amount in cash and one-half in scrip as above. The coupons with the half cash payments endorsed will be held by Nathaniel Thayer and Alpheus H. Hardy, in trust, as security for the payment of the scrip issued on account of the other half. The scrip therefore will have the same protection under the mortgage that the coupons would have had."

El Paso Northern.—President Thorne of the El Paso Northern R. has been notified by the Texas Railroad Commission that the total valuation of that road, including all franchises and appurtenances and property pertaining thereto, had been placed at \$75,038.59, and that the said report was ready to be made to the secretary of state. He was given ten days in which to file any objections.

Erie.—Workmen began on April 28 to construct the necessary roadbed on the Newark branch of the Erie Railroad preparatory to double-tracking that line. Work was begun at the Bergen tunnel and will be pushed through Harrison and Kearney to Newark. At the same time similar improvement will be made from the Paterson end of the line towards Newark. The Greenwood Lake branch, which crosses the Arlington section of this township, will be double tracked during the coming summer, and the tracks raised so as to abolish the grade crossing at Riverside revenue and Midland avenue.

Florida Southern.—The Florida Southern R., which was recently made a part of the Plant system, will shortly be changed to standard gage. The road is 248 miles long, but the officials expect to do the final work of spreading the rails in a day.

Jacksonville, Tampa & Key West.—The sale of the Jacksonville, Tampa & Key West road, which was set for May 6, has been again postponed, this time the date of sale being fixed at November 2.

Jefferson Coal & Railway Co.—The purchasers of the Mary Lee Coal & Railway Co. of Birmingham, Ala., which was sold some months ago under a decree issued in a suit brought by the Maryland Trust Co., of Baltimore, trustee for the bondholders, have organized and incorporated the Jefferson Coal & Railway Co. Besides the coal and mining interests the sale includes also the transfer of about seven miles of railroad built out of Birmingham. The capital stock of the new company is \$400,000.

Memphis & Charleston.—The Borg committee has issued a plan of reorganization of the Memphis & Charleston R. and invites the deposits of securities, including the trust receipts of the Iselin committee. The plan provides for foreclosure and for the formation of a new company. It is proposed to issue \$5,500,000 first mortgage 50 year 5 per cent gold bonds; \$4,000,000 4 per cent noncumulative preferred stock, and \$5,350,000 common stock. The average net earnings of the company for the past 5 years have exceeded the proposed fixed charges of the new company. The common stock is assessed \$2.50 per share, payable in quarterly instalments. In the distribution of securities, first mortgage extended sevens, ditto seconds and Tennessee lien sevens, are allowed 120 per cent in first mortgage bonds and 30 per cent in preferred stock. Consolidated sevens receive 100 per cent in bonds and 39 per cent in preferred stock; general sixes, 150 per cent preferred stock, and common stock 10 per cent in preferred stock and 100 per cent in common stock.

Newfolk, Albemarle & Atlantic.—This road which was sold at Norfolk, Va., on April 25 at foreclosure sale, was purchased by General Howard, of New York for \$190,000. It is thought that General Howard represents the Vanderbilt interests, and that the purchase was made by them to gain partial control of the Norfolk & Western, which has been a free lance on through rates this year.

Northern Pacific.—Improvements that will cost in the neighborhood of \$125,000 have been commenced on the Lake Superior division of the Northern Pacific road, and it is expected that the entire summer will be occupied in the completion of the work which has been laid out for improvements to the road between Duluth and Staples and Duluth and Ashland. Of the three steam shovels and seven work trains which will be employed in doing the work, one shovel and two work trains are already at work near Topside. It will be necessary to handle 400,000 cu. yds. of dirt and will necessitate a force of at least 500 men. The rebuilding of the burned warehouse and dock in Duluth harbor is also taken into consideration in this connection. Superintendent Wilsey, of the Lake Superior division, has received instructions to proceed with the reconstruction of the dock and warehouse as quickly as the necessary material can be placed on the ground, in order to give the company the use of the dock as soon as possible for lake and rail transactions. In addition to the work already outlined, there will be the filling of dock and elevator tracks, filling of the approaches to the Northern Pacific bridge across the St. Louis river (details of which we gave in this column in the issue of Feb. 29, of this year), and other bridges between Duluth and Ashland along the line, ballasting, laying new steel, grade revision, new sidetracks, etc. The filling of the approaches to the St. Louis river bridge will alone cost \$25,000, and other bridge filling will cost an additional \$18,000. Grade revision between Duluth and Staples will cost about \$35,000. The cost of reconstruction of the dock and warehouse will be \$15,000, and track and elevator filling about \$11,000. Laying of new steel will entail the expenditure of \$2,500, and sidetracks will cost \$7,500 more. These items represent the principal expenditures which the company has determined upon. About half of the entire estimate will be expended at or in the immediate vicinity of Duluth.

The decree ordering the sale of the Northern Pacific Railroad was signed by Judge Jenkins on April 28. This decree, which provides for the sale of all the properties of the company in three parcels, including stocks, bonds, and lands, is not final, however, the court having the right to make any modifications he may see fit, both as to the terms and conditions of the sale, and as to the distribution. This reservation gives the creditors, outside of the bondholders, both in and out of the reorganization agreement, the right to come into court at any time and apply for relief, which the court reserves for itself the right to grant, especially reserving jurisdiction for this purpose. Judge Jenkins also signed a supplemental decree which orders the sale of lands west of the Missouri river and which are held to be subject to a lien of the preferred stockholders. The land is to be sold in parcels in North Dakota, Montana, Idaho and Washington. The total indebtedness from the issuance of bonds alone by the company is found by the decree to be \$152,336,155.13. This, however, does not include the issuance of receiver's certificates, the collateral trust indenture bonds amounting to more than \$15,000,000, and the back interest on bonds amounting to \$44,051,500. The sale is to

ke place from the passenger depot of the Northern Pacific Railway, at West Superior, within 60 days, unless Judge Jenkins sees fit to interfere in the meantime. For the first parcel the bid must not be less than \$10,000,000, for the second not less than \$2,000,000, and for the third not less than 500,000. The expenses of the sale and of the foreclosure proceedings are first to be paid from the proceeds of the sale of the first parcel. The balance is to be applied to the general second mortgage, after the satisfaction of the prior liens, and if there is anything left it will apply to the general third mortgage bonds. The court reserves the right to set the sale aside, and if it is so ordered, any moneys received from the successful bidder is to be returned. A special provision is inserted giving the Farmers' Loan & Trust Co. the right to bid if it desires. This leads to the belief that the trust company will be the purchaser. The court also signed a special order relieving the older receivers, Messrs. Payne, Oakes & Rouse.

Omaha & St. Louis.—On April 27, at a meeting of the bondholders of the Omaha & St. Louis R. Co., in New York, the road was sold to a syndicate headed by Mr. Theo. Gilman, the New York banker. The proposition accepted from the syndicate—which is believed to represent either the Wabash or Rock Island companies—provides for the payment of 75 per cent on the 4 per cent gold bonds and 25 per cent in the stock of the new company that will take over the present property and franchises. The stock of the new company will be placed in escrow for five years, or until the payment in bonds is made. It will also pay off the indebtedness of the present company, amounting to about \$500,000. This Gilman syndicate also has an option on the Quincy, Omaha & Kansas City road, and it is expected the two roads will be consolidated, making a through line from Quincy to Omaha.

Rio Grande Western.—The grading on the extension of Sevier road, which is to be a part of the Rio Grande Western, is now completed from its former terminus at Salina south to the mines at Richfield, Utah. The work of track-laying on the extension of the Sevier Valley branch has been completed for 6 miles south of Salina. The company is having difficulty in obtaining men at \$2 per day for track labor. This is hindering the progress of the extension more than any other cause. The rails will be laid into Richfield, 30 miles, by the middle of next month. When the Sevier Valley road was organized in 1891 by the officers of the Rio Grande Western to extend that line south of Manti, 25 miles, a survey was made through to Marysville, 180 miles south of the former town. No construction work was done south of Salina at that time. The survey to Marysville has been recently revised, and it is stated that contracts for work south of Richfield have been let to Jansen Brothers, of Elsinore, Utah, and Ross Brothers, these two contracts carrying the road to Joseph City, about 10 miles south of Richfield. Vice President Dodge has stated that the extension of the line to Marysville depended largely upon the action of the people along the surveyed route in right of way matters.

Staten Island.—At their annual meeting, the stockholders of the Staten Island R. Co. elected the following directors for the ensuing year: Frank S. Gannon, Joseph Tate, Charles H. Bass, August Horner, Kintzing P. Emmons, George F. Kreischer, James J. Winants, Louis De Jonge, Jr., C. A. Canavella, James M. Fitzgerald, E. P. Goodwin, William King, and Louis Benziger. The directors met on April 27 and elected the following officers: Frank S. Gannon, president; Joseph Tate, vice president, and Edward Curry, secretary and treasurer.

West Jersey & Sea Shore.—The lines of the Pennsylvania R. in Southern New Jersey, comprising the West Jersey, the Alloway & Quinton, the West Jersey & Atlantic, the Camden & Atlantic, the Chelsea branch, and the Philadelphia, Marlton & Medford Railroads, will be on Saturday May 2 be merged into one road to be known as the West Jersey & Seashore R.

West Virginia & Atlantic.—It is reported that the Roaring Creek & Charleston R. and Roaring Creek & Belington R. have consolidated under the name of the West Virginia & Atlantic R. These roads lie in Barbour and Randolph counties, W. Va., and have been partly tributary to the West Virginia Central & Pittsburgh.

NEW ROADS AND PROJECTS.

Arkansas.—The Arkansas Valley, Guthrie & Western R. Co. has been organized and a charter granted, to build a railway from Fort Smith, Ark., in a westerly direction via Guthrie, Okla., to Albuquerque, N.M. The incorporators are W. P. McCoy, Watonga; Wm. Grimes, Kingfisher; W. N. Spurlock, F. H. Greer and J. W. McNeal, Guthrie; R. W. Hill and C. W. Turner, Muskogee. Capital stock, \$3,000,000.

California.—A company has been incorporated in California to build a railway in Siskiyou county between Mott and the McCloud river, a distance of 20 miles. The incorporators are Jos. Palmer, of New York City; Samuel Leavitt, Boston, Mass.; John A. Davies, David E. Miles, Wm. J. Branstetter, Castle Cray, Cal. The name of the road will be the McCloud Valley, and the capital stock is \$1,000,000, with \$20,000 subscribed.

Central America.—A dispatch from New Orleans, La., says: "The steamer Breakwater of the Royal Mail line from Belize and Port Cortez, Honduras, brought word that the two Washington, D. C., capitalists, Frye and Ritter, who went to British Honduras to construct an electric tramway from Cortez to Tuguicalpa, the capital, a distance of 250 miles, had received concessions from the president and that the road will be constructed at once. Frye and Ritter represent \$60,000,000. This is one of the greatest railway schemes ever projected in Central America by United States capitalists."

Georgia.—Mr. F. B. Sirmans, of Sirmans P. O., Clinch Co., Ga., and Mr. S. R. Patterson, are interested in the connection of the two towns of Du Port and Fitzgerald by a line of railroad. A line of road has already been built by Messrs. B. B. Gray & Co., of Willacoochee, and is in operation between Fitzgerald and Willacoochee, a distance of 22 miles, the distance between Du Port and Fitzgerald being about 42 miles. As projected, this line will be extended from Fitzgerald to Du Port, where it will connect with

the Plant system. The road runs through a level country and the cost of construction will be comparatively light. The country is heavily timbered with pine and cypress, and the land is of a rich clay subsoil, suitable for all kinds of truck farming and fruit raising. The town of Fitzgerald since November last, has grown to 8,000 inhabitants, and the people along the line of the proposed road have agreed to help the construction of the line.

The contract for building the new line from Quitman, Ga., on the Plant system, northeast 26 miles, to a connection with the Georgia Southern & Florida near Adel, has been let and work was begun this week. The road is being built by the South Georgia R. Co., recently organized, of which Mr. J. W. Oglesby is president and chief promoter. It is said the people of Quitman have subscribed quite generally to the funds, as the new line will give them a direct outlet to the north, east and west via Macon.

Indiana.—It is reported that Chief Engineer Graves and assistants have commenced the survey of the Indiana Central Railroad. This line is to be 70 miles long, penetrating the center of the Indiana oil field, and so far \$192,000 in subsidies have been voted by the towns on the line. Mr. Charles Mackey of New York is said to be backing the enterprise, and it is thought the road will be pushed through.

Kansas.—Under the name of Arkansas City, Blackwell & Southern, a company has been incorporated in Kansas to build a road from Arkansas City south into Oklahoma to Blackwell, a distance of about 20 miles from the Kansas state line. The directors are J. B. Tucker, Charles Day, Blackwell, Okla.; A. J. Seay, Wm. Grimes, Kingfisher, Okla.; T. W. Eckert, George S. Hartley, A. A. Newman, Howard Ross, C. L. B. Brown, S. T. Alton, Arkansas City. The line, which is to be operated either by steam or electricity, will have a capital stock of \$1,000,000.

Michigan.—It is now stated, as a fact, by parties interested, that within the next twelve months Petoskey, Mich., will have her third railroad, the plan being being nothing less than a well matured proposition by Petoskey business men to secure a branch from the Michigan Central to tap the Mackinaw division at Vanderbilt or Wolverine. A company of substantial business men consisting of C. F. Hankey, president; H. B. Wachtel, secretary; James Buckley, treasurer; John Keep, surveyor; Wm. Everett, H. O. Rose and D. J. Cushman have organized and caused a survey to be made of the proposed line. At a meeting held recently at the Cushman house, at which were two representatives of the Michigan Central road, it is said that sufficiently definite action was taken to assure the success of the enterprise in the immediate future.

Minnesota.—It seems to be pretty well understood that the Chicago, Milwaukee & St. Paul road is seeking an entrance to Duluth, and a plan is now said to be under consideration which contemplates the extension of the short spur running from Red Cedar, a town south of Eau Claire, Wis., to Menominee and Cedar Falls to Duluth. This proposed line will cross the Soo tracks at Poskin Lake and the Omaha tracks at Cumberland. This plan is thought to be more than ordinarily feasible as such a road, besides securing for the Milwaukee traffic in Duluth, would open the very rich timber and agricultural counties mentioned, more especially Burnett and Douglas counties. Burnett county has at present no railroad. Douglas is more fortunate in having the Omaha to pass through a small portion of its eastern territory. This new branch of the Milwaukee would pass through the western part of the county and secure all the business of that section. The Chicago connections of the Milwaukee with Duluth would be just as good as any of the roads at present operating in the Zenith City.

Oklahoma.—A force of surveyors is in the field running a route for a line which Dr. Griffin Gunn, president of the St. Louis, Oklahoma & Texas Air Line, proposes to organize and build from Perry southeast through Stillwater, Perkins and Chandler to the coal fields of the Choctaw nation. It is said that when Dr. Gunn takes up a project he pushes it to completion in the most rapid manner possible.

Pennsylvania.—The Butler & Pittsburgh R. Co., mention of which was made April 18, was this week formally organized in the offices of the Carnegie Steel Co. at Pittsburgh. The secretary was authorized to at once advertise for bids for construction of track and road bed. Although not definitely stated, it is thought the amount of capitalization is about \$3,000,000 which represents the initial investment of Mr. Carnegie and the others interested. The following officers were elected: J. T. O'Dell, of Boston, President; William N. Frew, vice president; T. M. Given, treasurer; R. A. Franks, secretary. The board of directors was constituted of Andrew Carnegie, William N. Frew, T. H. Given, F. S. Smith, J. T. O'Dell, R. A. Franks, and T. M. Carnegie, Jr. The principal offices of the new company will be in Pittsburgh. The Carnegie Steel Co. guarantees the road at least 3,000,000 tons of ore a year.

Grading is now completed on the Pine Grove Mills branch, which the Bellefonte Central road is building, and tracklaying will begin some time this week. It is hoped to have the 7 miles completed in about a month. It is then contemplated to make a further extension of about 20 miles through Strubles in the northern section of Huntingdon county to a connection with the Huntingdon & Broad Top road at Huntingdon. This new line will reach a section not now reached by any railroad.

Tennessee.—A mass meeting of citizens held at Knoxville, Tenn., endorsed a resolution memorializing the county court to call a special election for the purpose of voting a subsidy of \$1,000,000 to the Black Diamond system of railroads. This system, which has already been mentioned in this column, is surveyed a portion of the way, and will be a double track line from Madison, Ind., to the sea at Savannah, using the Pennsylvania lines from Madison to Chicago, and running south to Knoxville, with a belt line encircling that city.

A charter has been recorded by the secretary of state at Nashville, Tenn., for the Cairo & Tennessee River R. Co. which provides for the construction of a road beginning at Bristol, in Sullivan county, and running westwardly through the counties of Hawkins, Hancock, Claiborne, Union, Campbell and Scott, and entering the state of Kentucky near the state line between Campbell and Scott

counties, and thence through that state to Ft. Jefferson and the Mississippi river. Among the incorporators are J. M. Coulter, A. J. Harpole, of Tennessee; B. A. Neale, W. W. Robinson and E. S. Beaumont.

Virginia.—The Blackburg R. Co. has been incorporated in Virginia to build a railway from Christiansburg to Blackburg, a distance of 8 miles, and surveys of same are now being made. The incorporators are: Alex. Black and J. M. McBryde, Blacksburg, Va.; A. A. Phlegar, Christiansburg, Va., and W. H. Palmer and A. L. Boulware, Richmond, Va. The principal office will be at Christiansburg, and the capital stock is \$100,000.

Washington.—President D. C. Corbin, of the Spokane Falls & Northern Railway, has just returned from the east, having perfected arrangements by which he will proceed to construct the Columbia & Red Mountain Railway, a branch line which will leave the Santa Fe & Northern Railway at Northport, Washington, and run north across the international boundary into Rossland, the center of the Trail Creek mining camp. The line and branches will be about 18 miles long. Construction will begin about the first of May, and will be complete and in operation by September 1, 1896.

INDUSTRIAL NOTES.

Cars and Locomotives.

—Mr. Jas. T. Gardiner, 632 Rookery, who had the placing of the order, has contracted with Haskell & Barker for 100 flat cars for the Munising Railway, Michigan.

—The Florida & East Coast Railway is in the market for 200 freight cars—100 of which will be box cars.

—The Louisville & Nashville Railroad is reported as being about to build 300 freight cars.

—The Ohio Falls Car Works is building 2 coaches, 1 baggage and 1 postal car, for the Louisville, New Albany & Chicago.

—The annual meeting of the stockholders of the Youngstown (Ohio) Car Manufacturing Co. was held a few days ago. The directors elected L. E. Cochran president; B. F. Boyd, secretary and treasurer, and Andrew Milliken general manager.

—The Columbus, Hocking Valley & Toledo has contracted for the equipment of the cars of that road with automatic couplers at the rate of 200 each month until all the cars in service are equipped. The road has over 9,000 cars, of which about 3,100 are already equipped with the automatic couplers. The cost of the equipment will be about \$100,000. The interstate commerce law requires that all cars must be so equipped on or before Jan. 1, 1898.

—The Central of Georgia Railway will build 200 freight cars at its shops this summer. President Comer says that one of the large car manufacturing companies offered to build them itself in order to give its shop force work during the season. Even with this extra work on hand, the shops will work on reduced time.

—Announcement is made that the Pratt & Letchworth Co. of Buffalo, will hereafter devote more attention to the larger and heavier kinds of malleable castings for railway work and expects to push the coupler business in the manufacture and sale of the Pooley coupler. This company has recently furnished the malleable castings for the 1,000 cars for the Lehigh Valley, 1,250 cars for the Philadelphia & Reading, and 1,000 cars for the Delaware, Lackawanna & Western.

—The late contract closed by the Baldwin Locomotive Works with the Russian government for 60 heavy freight engines, makes 134 locomotives built at the Baldwin works for the Russian government since 1895.

—The receivers of the Philadelphia & Reading are reported to have applied to the United States court at Philadelphia for authority to order 1,000 additional coal cars, 25 refrigerator cars, 250 gondolas and 250 box cars.

—The preliminary tests of the Westinghouse-Baldwin locomotive made at the shops of the Westinghouse Electric & Manufacturing Co. at East Pittsburgh, are stated to have been entirely satisfactory. A public test of the locomotive is expected to be made within a very short time.

Bridges.

—The board of public work at Denver, Col., is reported as having decided to build a new steel bridge over Cherry creek at Lawrence street.

—Bids are asked until May 18 for constructing a 635 ft. steel highway bridge over Whitewater river at Richmond, Ind. Address for plans H. L. Weber, Cy. Engr.

—Reports state that plans for the West Genesee hoist bridge, Syracuse, N. Y., have been submitted to the counsel by C. W. Adams, state engineer, Albany, and if the plans are approved, bids will be asked for the construction at once.

—It is reported that the Youngstown Bridge Co., of Youngstown, O., has prepared plans for a \$220,000 steel cantilever bridge over the Tennessee river at Knoxville, Tenn.

—A bridge is projected by the city of Meadville, Pa., over old channel of French creek. W. A. Doane is city engineer.

—Proposals are wanted by W. G. Smith, Macon, Ga., until May 29 for building an iron bridge across the Ocmulgee river at that place.

—It is stated that bids will probably soon be asked for constructing a bridge over the Zumbro river Rochester, Minn., at a cost of \$15,000.

—It is stated that the Big Stoney Railroad Co. will at once arrange for the rebuilding of the bridge across the New river at Roanoke, Va., with solid masonry and iron work.

—The Hudson county board freeholders has appointed a committee to make arrangements for the construction of a new bridge over the Passaic river at South Fourth street, Harrison, N. J.

—The Dauphin (Pa.) Bridge Company which has been chartered with a capital stock of \$50,000 will have its general office in the Harrison building, Philadelphia. The

company's plant is the old one of the Dauphin Car Works, together with a new building 70 x 144 and considerable new machinery. The plant is practically ready to begin operations. The company will manufacture and erect bridge and structural iron and steel work.

The contract between Charles E. King agent of the Berlin Bridge Co., of East Berlin, Ct., and the towns of Gardiner and Randolph has been signed, and the new bridge has now a good prospect of being a reality June 15. The contract is in substance as follows: "The Berlin Bridge Co. of East Berlin, Ct., agrees for the sum of \$17,875, to build two spans of the G. and R. bridge, 400 ft. or more, the spans to be in Gardiner May 18 and the bridge ready for travel, June 15, as per plans and specifications attached. The Berlin Bridge Co. hereby agrees to furnish bonds in the sum of \$20,000 to faithfully perform the same.

The bid of the Edge Moore Bridge Co. of Wilmington, Del., for the construction of the permanent Lewiston and Auburn, (Me.) "south" bridge, has been accepted by the joint bridge committee of the two cities at \$45,940, including masonry, and to be completed by August 20. Mr. Stearns of Marquand & Stearns, New England representatives of the contractors, states that it would be a steel bridge, six piers and seven spans of about 102 ft. each. It will have a 20 ft. roadway and two sidewalks, each six feet in the clear.

Engineers of the Rome, Watertown & Ogdensburg Railroad Co., made a survey a few days ago and secured data regarding the proposed new bridge over the boulevard at Charlotte, N. Y. The old bridge has long been considered inadequate for the constantly increasing travel.

The Brazos River Bridge Co. wants proposals until May 15 for the construction of a highway bridge of iron. Plans and specifications are now ready and can be seen at office of J. I. Boggs, engineer, Houston, Tex., or G. S. Parker, secretary of the Brazos River Bridge Co., Bryan, Tex. Total length of superstructure, 490 ft.

It is stated that the question of appropriating \$75,000 for a bridge over Longwood avenue, Brookline, Mass., is being considered.

The King Bridge Company, of Cleveland, has finished the long highway draw bridge over the Yellowstone river, at Glendine, Mont. The total length of the bridge is 1,750 feet.

The Boonville & Howard County Bridge Co. has been organized to erect a highway bridge over the Missouri river at an estimated cost of \$200,000.

Bids for building Section 6 of the subway in Tremont street, Boston, will be received at the office of the Transit Commissioner until 12 o'clock m. of Thursday, May 7, 1896. It is intended that most of the work shall be done by tunneling, and little of the surface can be occupied during the day. The section is approximately 1,085 ft. long. The subway from near Scollay Square to Hamilton Place, a distance of about 1,035 ft., will consist of masonry side walls and a masonry arch spanning two tracks. From thence to the junction with the work already built in front of Park street church there will be two single-track subways, of construction similar to that of the two-track portion—each being about 50 ft. long. The inner dimensions of these subways will be approximately as follows: Two-track, 18 ft. in height from invert, 23 ft. to 30 ft. span; easterly single-track, 16 ft. in height from invert and 13 ft. span; westerly single-track, 16 ft. in height from invert and 15 ft. span. The depth from the surface of the street to the bottom of the subway is approximately from 26 to 35 ft. Some other items are estimated to be as follows: 28,000 cu. yds. earth excavation; 125 tons iron and steel, furnished by the Commission, to be set in place; 10,800 cu. yds. concrete and brick masonry.

It is reported that a 300 ft. bridge over the St. Francis river, belonging to the Quebec Central Railway Co., was recently washed away.

Buildings.

It is stated that the erection of new machine and wheel shops of the Atchison, Topeka & Santa Fe, at Argentine, Kan., will be commenced soon. The new shops will be about 80 x 200 ft. Considerable new machinery will be ordered for these shops, including a wheel boring machine, axle lathe, wheel press and wood-working machinery.

The entire block bounded by Cass avenue, Collins and Dickson streets and Broadway in St. Louis has been purchased by the Louisville & Nashville Railroad Co., for \$450,000. The eastern half of the block adjoining on the north and extending along the east line of Collins street from Cass avenue to Florida street, owned by the Merchants Bridge Terminal Railway Co., was also bought by the Louisville & Nashville people, the purchase price being \$34,054. An immense building will be erected on the first-named block, and will be used as a fruit and produce exchange, shipments being placed on the market immediately after their being unloaded under its roof.

The Buckeye Malleable Iron & Coupler Co., of Columbus, O., has recently purchased a tract of land adjoining its present works, and will soon erect three additional buildings containing new annealing ovens and increasing the output to 8,000 couplers per month.

A large plant is to be built at Salem, Mass., by the Murphy Iron Foundry Co.

The Northern Pacific Railway Co., has recently met with a serious loss at Duluth. The company had brought its new warehouse about to the point of completion when the structure caught fire from a tar kettle, and as a result almost the whole building was destroyed together with the dock upon which it was built. The building was 600 ft. in length and was designed with several modern conveniences. The company was especially in need of this building as its facilities for handling goods at this point have been greatly curtailed for the past few years owing to the numerous complications through which it have passed. The loss to building and dock was about \$16,000 largely covered by insurance.

The Alabama Great Southern Railroad is to erect a machine shop at Chattanooga, to cost \$4,000. A. T. Hooker, master mechanic will have charge of the matter.

The board of directors of the Memphis Freight Bureau has inaugurated a movement to secure the location

in Memphis of the general shops of the Illinois Central Railroad.

On the morning of April 22 the machine department, blacksmith and boiler shops and engine rooms of the Seaboard Air Line Railway's main shops at Raleigh, N. C., were entirely destroyed by fire. The fire originated in the wooden roof near the chimney stack and in a few minutes the entire building was on fire. The round house and oil and supply houses adjoining were saved. The damage to the building is \$15,000, to the machinery \$35,000, all covered by insurance. One hundred and twenty-five men are thrown out of employment.

The big addition of the Westinghouse Electric & Manufacturing Co. to its foundry department has been commenced. It will be of iron, 60 x 500 ft., and is expected to be completed by June.

It is stated that the Louisville, New Albany & Chicago Railroad Co. is to construct a new freight house in Louisville, Ky.

The contract for building the new Union station of the New York, New Haven & Hartford at Providence, R. I., has been awarded to Horton & Hemingway, of Providence. It was decided to let all the work involved in building the station to one firm, which will let sub-contracts for the various classes of work. The structure is to be completed by June 1, 1897. The main building will be 500 ft. long by 100 ft., and of mottled brick with trimmings of granite and Long Meadow stone. For the interior glazed brick will be used, the woodwork being of red oak. Besides the main structure there will be two buildings 60 ft. x 125 ft., one at each end of the station, to provide accommodations for the express companies and for offices.

The shops of the Knoxville, Cumberland Gap & Louisville Railroad, at Middlesborough, Ky., will be removed to Knoxville. This road is controlled by the Southern Railway; C. H. Hudson, chief engineer, Washington, D. C.

The West Virginia Central & Pittsburgh Railway Co. has arranged for the building of additional shop room for building new freight cars at Elkins, W. Va. Extension of shop contemplate a building 64 x 226 ft. Also for some improvements along its line—consisting of two new water stations and improvement in alignment at two points which can be done at an expense of about \$6,000, and the removal of two wooden trestles by substituting masonry and steel girders.

The general managers of the Missouri, Kansas & Texas, the International & Great Northern, the Gulf, Colorado & Santa Fe and Galveston, Laporte & Houston railways have arrived at the solution of the union depot problem in Galveston. The depot will be built on the site recently purchased by the Gulf, Colorado & Santa Fe, at the intersection of Strand street and Bath avenue. The site embraces two half blocks running west on the north side of the Strand the length of two blocks and one street to Twenty-seventh street, with a frontage on Bath avenue of one-half block, and will have a capacity to accommodate eight tracks, with the necessary platform spaces for the accommodation of passengers. The building to cost \$175,000, upon which work will begin immediately and pushed to completion as rapidly as possible. It is to be owned by a joint stock company, in which all of the above railway companies are to take stock, and to be used by them jointly as a passenger depot.

Iron and Steel.

The Delaware Iron Works, New Castle, Del., are engaged on a large order for trolley and telegraph poles for North and South Africa. Two hundred tons of poles were shipped this week for Cairo and Cape Town, and the balance of the order, amounting to 1,000 tons in all, will be forwarded very shortly.

Rogers, Brown & Co., Chicago, has on exhibition in its office an interesting specimen for foundrymen. It is a large screw, 2 in. in diameter, turned from a pig of Watts gray forge iron. The thread is remarkably perfect, showing the excellent quality of the iron. A large shoulder is left on the end of the screw, showing the shape of the pig from which it was turned. Watts pig iron is smelted from brown and red fossil ores, mined in the vicinity of the furnaces at Middlesboro, Ky.

The Youngstown Iron & Steel Roofing Co. has recently perfected a bridge floor, composed of iron manufactured in V shape, the concave part to be filled with cement.

The New York office of the Otis Steel Co., Limited, will be located in the Manhattan Life Building, No. 66 Broadway, on and after April 30.

The Carnegie Steel Co., Limited, has recently purchased another piece of river frontage in Homestead, 180 ft. square, at a price said to be about \$15,000. The Carnegie Co. desires this piece of ground to complete its right of way for the Union Belt Line which will connect the Homestead, Edgar Thomson and Duquesne Mills of the Carnegie Steel Co., Limited. The belt line railway will also be the terminus of the new Pittsburgh, Butler & Lake Erie extension of the Pittsburgh, Shenango & Lake Erie road. This company is also constructing a coffer dam in the Monongahela river at Duquesne to furnish water for its mills. The water will be pumped from the dam to a stand pipe, which will be 160 ft. high and 16 ft. in diameter. The pumps are of modern style.

The Johnson Forge Co., of Wilmington, Del., after a long shut down, will put its plant in thorough running order at once, and will add new buildings to increase the output of the hammer shop.

Dispatches from Vienna say that orders for iron in Austria are so large that the manufacturers are unable to fill them. Some works have been obliged to buy their steel ingots in England in order to meet their contracts.

The recently organized Keystone Axle Co., which is now having its plant erected at Beaver Falls, at its annual meeting elected these officers: D. A. Clark, of Baltimore, president; John T. Rowley, of Tyrone, vice president; and Thomas R. Torrence, of that city, secretary and treasurer.

Fox Solid Pressed Steel Co. announces the removal of its general offices to rooms 1405, 1407 and 1409, in the Fisher building, 281 Dearborn street, corner of Van Buren street, Chicago.

Machinery and Tools.

The Whitney Manufacturing Co., recently organized at Hartford, Conn., with C. E. Whitney president and manager, has purchased the plant of the Woodruff Manufacturing Co. of that city and will manufacture all the machines and specialties formerly made by the latter concern.

Alfred Box & Co., Philadelphia, reports business brisk in its crane department. Among orders recently filled it mentions the following: Four jib cranes for the Newport News Brass & Iron Foundry, Newport News, Va.; two 20-ton traveling cranes for the Edison Electric Illuminating & Power Co., Long Island City, N. Y.; a 10-ton traveling crane for the New London Street Railway Co., New London, Conn.; a 10-ton traveling crane for the People's Traction Co., Willow Grove Station, Philadelphia, and a hand traveling crane for the West India Fibre Co., Salem, Mass. Among the orders in course of fulfillment they mention an electric traveler for R. Hoe & Co., New York City; a traveling crane for the Cambridge Pumping Station, Cambridge, Mass.; two 5-ton traveling cranes for the Steinway Railway Co., Long Island City N. Y.; a belt driven traveling crane for the ice plants of the Louisville Cold Storage Co., Louisville, Ky.; a 10-ton belt driven traveling crane for the Harrison Safety Boiler Works, Philadelphia; three 5-ton cranes for the Chas. Hillman Ship & Engine Building Co., Philadelphia, and two 10-ton cranes for the Coatesville Boiler Works, Coatesville, Pa.

The Harrisburg (Pa.) Foundry & Machine Co. has received an order to build two 300 horse power engines for an electrical plant at Braintree, Mass. This company just made a shipment of two 300 horse power engines to the southern part of Italy.

The Svenson Drawing Tables and Accessories are described in an 18-page pamphlet illustrated, not standard size, which has just been received from Mr. John Svenson, mechanical engineer, Library Building, Scranton, Pa. This drawing table is adjustable and is arranged to be used upon the top of an ordinary table. It is adapted to be raised or its angle changed. It may be put in a horizontal or vertical position or in a position intermediate between the two. A parallel ruling attachment is described. Those interested in obtaining simple and convenient drawing tables should send for this catalog.

Miscellaneous.

What is said to be the largest smoke stack in the United States, was used for the first time last week by the Pennsylvania Salt Manufacturing Company, at Natrona, Pa. It is 200 ft. high, 130 ft. in circumference at the base, and 90 ft. at the top. It is made of steel plates, lined with fire brick, and was built to carry off the smoke and objectionable vapors from the works.

The mineral wool plant at Wheatland, Pa., has grown very fast in the last two years in respect to the amount of product. Shipments are being made to Europe, Australia and to all parts of the civilized world.

A company has been formed under the name of the Bellefonte Power & Hammer Company, at Bellefonte, Pa., for the purpose of selling the Jenkins power hammer and gas engines. Jenkins & Lingle will continue to manufacture as heretofore.

On May 1, the New York Air Brake Company transferred its western branch office, which has been located in the Western Union building, formerly known as the Phenix building, to rooms 1401-1403 Fisher building, corner of Dearborn and Van Buren streets.

The Boston Belting Company of Boston and New York has recently sent out two catalogs entitled, "Fire Hose" and "Garden Hose," of 33 and 15 pages respectively, illustrating and describing the different forms of hose and attachments, racks, couplings, nozzles, etc., manufactured and sold by the company. These pamphlets are illustrated and are furnished with indexes and prices of the different articles described.

During the past ten days the New York Belting & Packing Co. has taken orders for installing its interlocking rubber tiling on four steamers and one entire train of cars. The interlocking feature, making it absolutely impossible to displace the tiling, peculiarly adapts this material for use in all places where there is vibration, such as on steamers and railroad trains. On land, its durability, beauty and noiselessness recommend it for vestibules, aisles, corridors, hospitals, court rooms, and other places where such features are desirable.

The Peerless Rubber Manufacturing Company, of 16 Warren street, New York, will commence at once the erection of new buildings which will more than double the capacity of its plant. When these buildings are completed this company will employ over 300 men. The business of this company is rapidly growing.

On and after May 1 the New York office of the National Switch & Signal Co. will be transferred to Easton, and all correspondence formerly addressed to No. 32 Liberty street should be addressed to Easton.

Messrs. William H. Bryan and H. H. Humphrey, consulting mechanical and electrical engineers, announce by means of an 18-page pamphlet that they have an office in the Turner Building, St. Louis, for the purpose of consultation, examination, estimating, testing, etc., in connection with mechanical and electrical engineering subjects pertaining to water works, electric lighting railway and power systems, transmission, steam, plants, heating and ventilation, smoke abatement refrigeration, hydraulic apparatus and elevators. The pamphlet contains a large number of references showing that they have done a great deal of professional work, and the terms and equipment of the engineers is stated.

Mr. Royal C. Vilas announces that he has assumed control of the National Electric Headlights, and is now prepared to promptly fill all orders and guarantee satisfaction. These headlights are the only locomotive electric headlights in the world which are reliable and successful in operation. They are in use on many railroads in this country and also in foreign countries, with most satisfactory results. They are an additional safeguard to the traveling public, and many instances can be sighted where what might have been terrible accidents were prevented by their use.